THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXII. No. 795.] LONDON, AUGUST 6, 1878. [30TH YEAR.] Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

SPENT OXIDE PURCHASED IN ANY QUANTITY.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
PROPRIETORS: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
WORKS: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
LIMITED,
Established at the commencement of Gas Lighting.
BRANCH ESTABLISHMENTS:
48, GREEK STREET, SOHO SQUARE; 83, COMMERCIAL ST., SPITALFIELDS; 35, 36, 37, & 39, GRANBY ROW, MANCHESTER. } LONDON.
16, ELLIS COURT, AIRE STREET, LEEDS.
MANUFACTORIES: ALMA TUBE WORKS, WALSALL, AND OLD PATENT TUBE WORKS, WEDNESBURY.
J. R. & Co., Ld., are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. & Co., Ld., make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
Lists may be obtained on application to
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET.
HEAD LONDON WAREHOUSE:
234, UPPER THAMES STREET, LONDON, E.C.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS
CAST & WROUGHT IRON TANKS FOR DITTO
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.

J. & H. ROBUS,
BUILDERS AND CONTRACTORS
FOR THE
ERECTION AND REBUILDING OF GAS AND WATER WORKS.
ESTIMATES FREE
FOR MAIN-LAYING AND GENERAL REPAIRS
RETORT-SETTING A SPÉCIALITÉ.
ROBUS'S IMPROVED RETORT-SETTINGS guaranteed to carbonize a large amount of coal with a small per cent. of fuel.
N.B.—All kinds of Fire Goods, &c., kept in stock for immediate delivery. Orders promptly attended to.
BELL GREEN, CATFORD, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

GEORGE GLOVER & CO.
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
FOR THE ENGLISH GOVERNMENT
AND FOR THE GOVERNMENT OF THE NETHERLANDS
AND OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government,
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS
Warranted to Measure correctly & not to vary.
PARIS 1867. LONDON 1862. CLASS 10. MANCHESTER 1876. SILVER MEDAL. VIENNA 1873. LONDON 1862. CLASS 10. AMSTERDAM 1869. DIPLOME D'EXCELLENCE
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.
236, GEORGE STREET, GLASGOW, & 30, LANCASTER AVENUE, MANCHESTER.
FOREIGN AGENTS.
DAHL BROTHERS, COPENHAGEN. | W. HOVEN & SON, ROTTERDAM.
A. [illegible] & CO., FRANKFORT O/M. | COPLAND & McLAREN, MONTREAL
A. DEMPSTER, 57 ELIZABETH STREET, MELBOURNE.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

AND

COOMBS WOOD TUBE-WORKS, HALESOWEN,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS,

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,

UP TO FOUR FEET IN DIAMETER.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

Warehouses: London, Liverpool, Manchester, and Lille.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**
"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.
Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.
Full particulars will be sent on application to above address.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast-Iron and Tin Cases,

OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

STATION METERS AND GOVERNORS,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

TRADE MARK

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;
LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;
HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;
GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

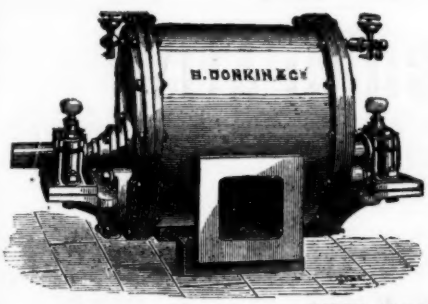
ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

J. BEALE'S NEW PATENT GAS EXHAUSTERS

MANUFACTURED SOLELY BY

B. DONKIN & Co.



These Exhausters have but one solid slide, which ensures less wear and friction, and thus fewer repairs are necessary. They are made with two outside bearings and with all latest improvements.

MESSRS. B. D. & Co. ALSO MAKE

STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS.
IMPROVED GAS-VALVES.
VALVES FOR AMMONIACAL LIQUOR, TAR, and HYDRAULIC MAINS,
VALVES FOR SPECIAL PURPOSES, WITH COLUMNS, SCALES, AND GAUGES.
STEAM, GAS THROTTLE, AND BYE-PASS VALVES.
SCREW WATER-VALVES, &c.

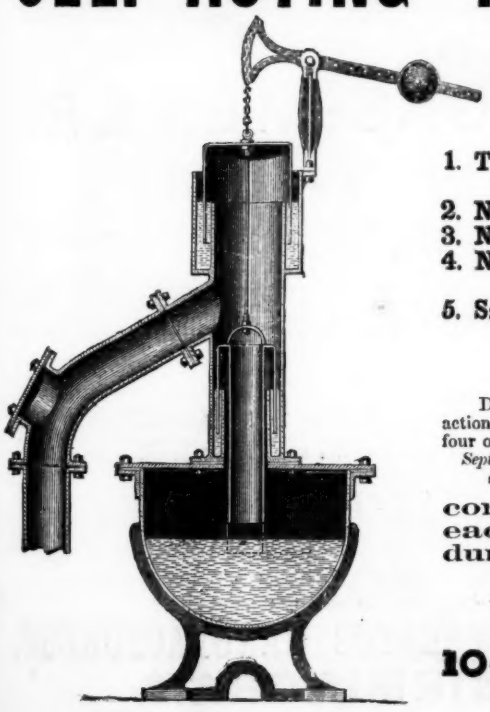
LISTS, PRICES, AND INFORMATION ON APPLICATION.

WORKS: 55a, BLUE ANCHOR ROAD, BERMONDSEY, LONDON, S.E.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. **There is no pressure on the Retorts.**
2. **No deposit of Carbon.**
3. **No scurfing is required.**
4. **Never a choked Ascension-Pipe.**
5. **Saves Fuel and Wear and Tear.**
6. **Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.**
7. **Is never out of order.**
8. **Requires no attention.**
9. **Is perfectly automatic in its action.**

Testimonial from the Proprietor of the Apeldorn Gas-Works.

DEAR SIR,—In reply to your inquiry, the Self-Acting Dip-Pipes, which have been in action at my works for two years, give entire satisfaction. I forward you order for four others.

Yours truly,

Sept. 9, 1877. R. BAKKER.

These Dip-Pipes can now be supplied complete, except the flanched bend, for £4 each, which includes the charge for licence during the whole term of the patent.

APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.,

Who fix the Dip-Pipes, at a small Charge, when required.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

THE LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY GAS-METERS, GOVERNORS, PRESSURE & EXHAUST REGISTERS;

ALSO THE

IMPROVED

COMPENSATING GAS-METER,

HUNT'S PATENT.

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 115, VICTORIA STREET, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

Attention is called to their Dry Meters in Wood Cases, as used by the principal London Gas Companies. These Meters are especially suitable for seaport towns and for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

IMPROVED
COMPENSATING GAS-METER.
HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

These Meters can now be supplied in either TIN-PLATE or CAST-IRON CASES, and OLD METERS converted to this plan. GAS COMPANIES and CORPORATIONS will find it to THEIR ADVANTAGE to adopt these Meters.

EXTRACTS FROM REPORTS.

"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*

"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*

"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

JOHN BENT & SON,

WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,

BELL BARN ROAD, BIRMINGHAM.

Established 1830.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS.

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

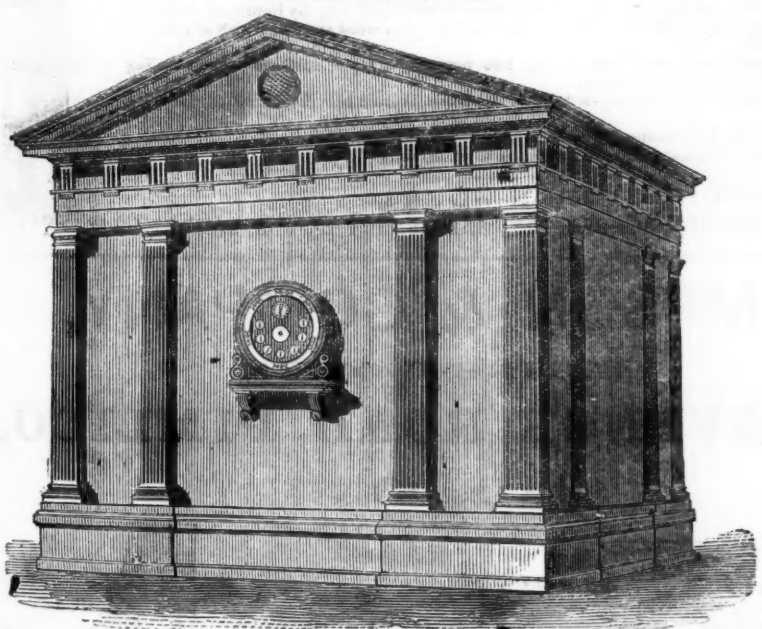
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

8, FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD

LONDON, N.

DEMPSTER & SONS'

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 FEET WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, NEAR HALIFAX.

CATOPTRIC

STREET

LAMPS.

The NEW PATTERN

IS IN USE THROUGHOUT

CHEAPSIDE.

Mr. SKELTON,

37, ESSEX STREET,

STRAND.

LAMP-PILLARS,

GAS-LAMPS, FOUNTAINS.

Our New and Choice Designs for the above, with prices, are forwarded to any part of the world on receipt of twelve stamps. Estimates for work at home or abroad.

W. T. ALLEN & CO.,

(Late TURNER AND ALLEN), Established 1847,

GAS & WATER ENGINEERS & CONTRACTORS,

SOMERSET BUILDINGS,

LAMBETH HILL, UPPER THAMES ST.

(Late 203, Upper Thames Street), LONDON, E.C.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS

RATCHET BRACES, LIFTING-JACKS,

ANVILS, VICES,

AND ENGINEERS TOOLS GENERALLY.

LONDON WAREHOUSE:

90, CANNON STREET, E.C.

R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. | MEDAL, LONDON, 1862.

GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners.

MEDAL FOR PROGRESS, VIENNA, 1873.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes;

TIN TUBES;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

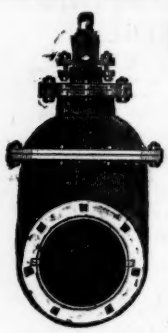
METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:
R. W. W. & CO.

LONDON OFFICES & SHOW-ROOMS: 141, FLEET STREET, E.C.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.

These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

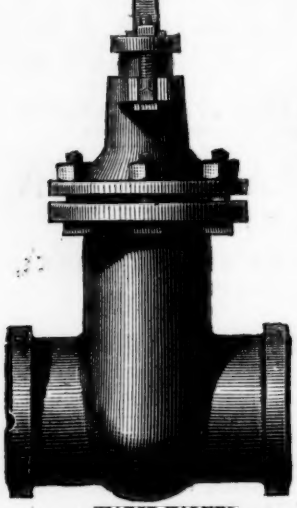
A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.



WATER-VALVES.
All Sizes, Flange and Socket, kept in Stock, tested to 1000 feethead.

SIMPSON & COMPANY,

ENGINE-WORKS,

GROSVENOR ROAD, PIMLICO,

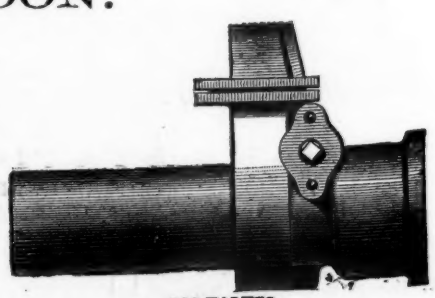
LONDON.

SCREW-COCKS, HYDRANTS,

SLUICES, PENSTOCKS,

And all other Machinery for

WORKS OF WATER SUPPLY, DRAINAGE AND IRRIGATION.



GAS-VALVES.
All Sizes, Flange and Socket, kept in Stock, tested to 100 feet head.

TANGYE BROTHERS AND HOLMAN,

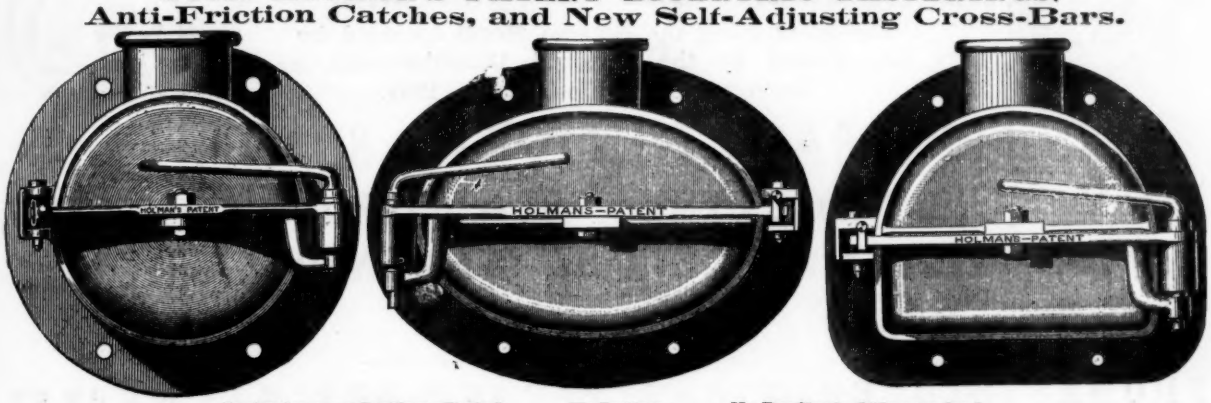
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

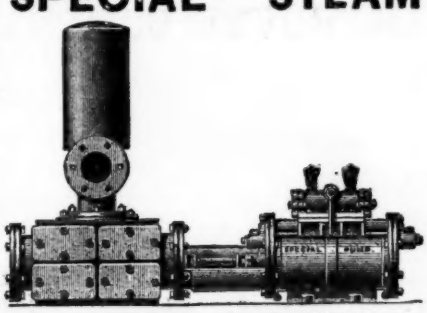
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

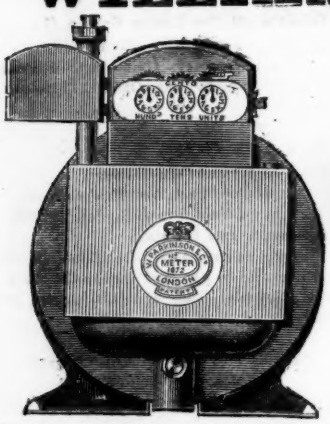
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

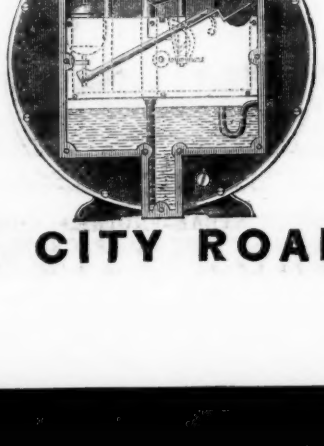
STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

CONTENTS.

	PAGE
Circular to Gas Companies:—	
The Electric Light in the Metropolis, and its Influence on the Value of Gas Shares	193
The Average Meter System in St. George's, Hanover Square	193
Threatened Prosecution for Excess of Sulphur Impurities in London Gas	193
Meeting of the York Gas Company	193
The Gas Supply of Salterhebble	193
Lectures at Pinner on Cooking by Gas	193
Mr. Leoni on Cooking by Gas	194
Mr. Macpherson on the Duration Test as a Standard of Comparison	194
Water and Sanitary Notes:—	
Devonport Water Supply	194
Drought at Bermondsey—Deputation to the Local Government Board	194
The Metropolitan Board and Scott's Cement Process	194
The Native Guano Company at Aylesbury	194
The Water Supply of Stockton and Middlesbrough	194
The Water Supply of the Health Resorts of England and Wales	195
Correspondence:—	
Mr. Methven's New Standard for Determining the Illuminating Power of Gas	195
The Water Supply of Devonport	195
Stoppages in Inlet-Mains to Gas-Works	196
Gas Companies and Alterations in Street Levels	196
Water-Rates in the Metropolis	196
Parliamentary Intelligence:—	
House of Lords Committee—Durham Water Bill	196
Legal Intelligence:—	
High Court of Justice—Chancery Division—	
In re The Herne Bay Water-Works Company	201
In re The Pure Carbon Gas Company, Limited	202
Miscellaneous News:—	
Coke from Anthracite Dust	194
Sales of Gas Shares	195
Lectures on Heating and Cooking by Gas	195
The Rawfolds Water Company and the Liversedge Local Board	195
Reigate Gas Company	196
Metropolis Water Supply	202
Meeting of the York United Gaslight Company	202
Meeting of the Cambridge University and Town Gaslight Company	203
Meeting of the York New Water-Works Company	203
Meeting of the Norwich Water-Works Company	204
Meeting of the Wellington (New Zealand) Gas Company	204
Meeting of the Hokitika (New Zealand) Gas Company	204
North British Association of Gas Managers	204
Sale of Littleborough Gas Company's Shares	207
British Association of Gas Managers	207
Trade Reports	210
Malvern Link Gas Company	211
Wisbech Gas Company	211
Sale of Gas Shares at Croydon	211
Liverpool Water Supply	211
West Houghton Water Supply	211
Register of New Patents:—	
Wilson, W. P.—Manufacture of Gas	211
Sirié, C. A.—Carburetting Lighting Gas	211
Applications for Letters Patent	212
Patents which have passed the Great Seal	212
Patents which have become void	212
Share List of Metropolitan Gas and Water Companies	212

TO CORRESPONDENTS.

J. M.—*Carburetted hydrogen is not a specific poison. It renders people exposed to its influence insensible, and, if the inhalation be prolonged, it kills, in consequence of the deprivation of atmospheric air.*

R. H. Patterson.—*Received.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 6, 1878.

Circular to Gas Companies.

The desire to make a trip just now to Paris at some one else's expense is, perhaps, natural. We have mentioned that deputations from several Corporations have paid visits to the French capital in order to acquaint themselves with the electric light. A Member of the Commission of Sewers has, it appears, been smitten with the idea that it would be advisable for a deputation from that body to cross the Channel with the same object, but a majority of the Commissioners seem to think a visit is unnecessary. The Commissioners, at present, are engaged in collecting information respecting the light, and, no doubt, after the recess, we shall be treated to an able report on the matter. In the meantime, an invention has been brought to London under the auspices of that distinguished *entrepreneur* Mr. John Hollingshead, who proposes to illuminate the Gaiety Theatre by its means. M. Lontin's lamp, the invention now being exhibited, is said to surpass all others of the kind. The electric current, it is reported, can be so divided that one machine is capable of supplying electricity to twelve lanterns, each equal in intensity of light to two hundred Carcel burners, or twenty-four lanterns of one hundred Carcel burners each. The cost of the light, we are told, is exceedingly small, not amounting to one-half that of gas. All these statements must be taken *cum grano salis*, for demonstrative experiments are still wanting, at all events, in this country. So far, the experiments made at the Gaiety cannot be said to be great successes. The arrangements are novel, and in the course of a few days all the alleged defects in the instruments may be remedied. We give our readers this information in order that they may not be left in the dark as to what is being done in the world of electric illumination. Of course, the enemies of Gas Companies write and speak confidently of the ultimate adaptation of electricity for lighting houses. We believe, however, that the day when this will be accomplished is very distant. There is a fair field for both gas and electricity, and we have no fear that the profits of Gas Companies will be diminished by the rivalry.

At the same time, gas property does not suffer in value. There was recently a large sale of shares in the Croydon Commercial Gas and Coke Company, who are now under the sliding scale, and pay dividends of eight and a half on the seven per cent. shares, and eleven and a half on the ten per cent. shares. The nominal value of the shares is £5, but those entitled to ten per cent. fetched an average price of £11 17s. each, while the seven per cent. brought £8 10s. each. Twenty-five pound shares in the Farnham Gas Company (unincorporated) recently fetched £41 each. It may be urged by some that the electric light will be slow in making its way into country districts, and it is only the interests of undertakings in large cities which are threatened by competition with the electric light. There are Shareholders who would have us imitate the fabled practice of the ostrich, and hide our heads so as not to see any danger that may approach. We believe there is no danger here, at all events, but feel bound to keep our readers *au courant* with passing events.

The Vestry of St. George's, Hanover Square, appear to be very well satisfied with the average meter system, as applied to their public lights. It is credited with having produced a saving in the past year of £665. It is admitted, however, that two-thirds of the economy has resulted from a reduction in the hours of lighting, and that only one-third is due to the meter system. Small economies of this kind are no great matters, but the great advantage of the meter system is that it prevents the constant bickerings which take place between Local Authorities and Gas Companies when public lights are supplied under contract. The average meter system gives some assurance to the Authorities that they only pay for the gas which they consume, and that must be a satisfaction to them.

The Metropolitan Board of Works have decided on taking proceedings against the Commercial and The Gaslight and Coke Companies for excesses of sulphur impurities—that is to say, if, on appeal to the Chief Gas Examiner, the Companies be not excused for the defaults; but, as the cases must be considered *sub judice*, we must refrain from making any observations on them. We are not told how much the sulphur was in excess; but, whether it was great or small, it does not matter. We do not understand this outbreak of zeal on the part of the Board, for in past times they have overlooked a large number of excesses.

The York United Gas Company held their half-yearly meeting last week, and we are glad to see that, notwithstanding the large reduction in the price of gas made last year, the Company are in a highly prosperous state. It appears that the profit made was not quite equal to a payment of full dividends, which were made up from the reserve-fund, we presume. The Company are about to issue eight hundred new shares of £10 each, and, having been fortunate enough to escape the auction clauses, the Directors will have the power to allot these amongst existing holders.

When different parts of a district are supplied with gas from two sources, the price charged in the one case being much lower than in the other, dissatisfaction is sure to exist. Such a state of things now obtains at Salterhebble, which appears to be an outlying district of the Borough of Halifax, but which is supplied with gas by the Elland Gas Company. In other parts of the Borough of Halifax, the Corporation supply gas at a charge of 3s. 4d. per thousand cubic feet, with a discount, while the Elland Gas Company charge 3s. 8d., with a similar discount. Thus there would appear to be a difference of about fourpence in the two rates, hence the dissatisfaction. The consumers are naturally desirous to be supplied by the Corporation, but the Elland Gas Company are in possession of the ground. Competition is, of course, out of the question; but a reasonable suggestion has been made, that the Corporation of Halifax should buy up the plant of the Elland Gas Company lying in the district, and furnish the supply at the rate desired by the consumers in Salterhebble. The Company are willing to sell, but the Corporation do not seem desirous of purchasing, and object, moreover, to supplying Salterhebble at a loss; thus the dissatisfaction is likely to remain for some time longer.

The Pinner Gas Company are doing their utmost to make known the advantages of the use of gas for illuminating, heating, and cooking purposes. They recently invited Mr. Henry Gore to deliver a course of two lectures, which have been very

successful. Pinner is a large and scattered district, in which it is highly desirable to make the virtues of gas known, so that its consumption may be largely promoted. The Directors have taken wise step, and we may express a hope that the example will be followed by many other Companies.

At this time of day it is necessary to say but very little by way of advocating the use of gas for culinary purposes, but this little was very well said by Mr. Leoni, whose paper, read before the Meeting of the British Association of Gas Managers, we publish in another column. Any one who will take the pains to inquire, will soon make up his mind that the use of gas affords the cheapest and best fuel for cooking—at all events, in the summer months. In large establishments, such as the London Hospital and Whiteley's, quoted by Mr. Leoni, gas may be used continuously all through the year; but in a small—say, an eight-roomed—house, gas in winter, for the sake of warmth, will be superseded by coal, where coal is cheap. The kitchener which cooks the food for eight persons is not easily made available for the supply of heat to warm a kitchen. Servants have an unconquerable prejudice against it, and, on a winter evening, long for the brightness of a coal fire. This is one of the obstacles which will always stand in the way of the use of gas as fuel in this country. When Gas Companies let out cookers, as we hope many shortly will, they must put them in such positions and make the connections so that they may easily be removed when the long, cold evenings come on. In the small houses in which, we know, the gas for cooking is always cut off in winter, a certain amount of difficulty would be caused if the apparatus were lent on hire by Gas Companies, in consequence of non-use during the winter months; but in the course of a very few years, arrangements could be made which would satisfy all.

With a prejudice for candles which we entertain, we are quite willing to admit that a better standard is a desideratum. How far the duration test supplies this, we will not undertake to say. Others, besides Mr. Macpherson, whose able paper, read before the North British Association of Gas Managers, was published last week, and the discussion of which appears in the present issue of the JOURNAL, advocate its use, and we should be glad to see more investigators examining its merits. We believe it would be found useful, and it might, perhaps, supply the needed want. We confess to not perfectly comprehending Mr. Young's objections to it. Consumers undoubtedly pay for light; but they are charged for volume. Whether the duration of a cubic foot is fifty-four or fifty-nine minutes, does not matter. The fifty-nine minute gas will, of course, give the greatest amount of light; but the charge is the same. We may express some sympathy with Mr. Macpherson when he contends that corrections for temperature and pressure are needless refinements. Absolute truth in gas-testing is, unfortunately, unattainable; and the consumer pays for his gas according as it is registered by his meter, irrespective of barometric and thermometric disturbances. We are very glad to find experimenters entering upon this important and interesting line of research, and we entertain no doubt that, in time, some valuable conclusions will be arrived at.

COKE FROM ANTHRACITE DUST.—At the suggestion of a member of the Geological Survey of Pennsylvania, the writer made a number of experiments in using anthracite coal as a basis for coke. The additions of bitumen, gas tar (gas-works waste), or bituminous coal were all used in the mixtures, with a view to supplying the necessary cementing qualities lacking in anthracite. An ordinary blacksmith's fire supplied the heat required, blacklead crucibles of about one pound capacity being used to receive the mixtures. The results arrived at proved several points:—1. That any mixture, varying from 50 per cent. anthracite dust and 50 per cent. bituminous dust to 75 per cent. anthracite dust, 10 per cent. gas tar or bitumen—for they are interchangeable—and 15 per cent. bituminous dust, will make a beautiful steely, lustrous, heavy coke. 2. That a heat higher than can be obtained in a coking oven is an absolute necessity to produce a good anthracite coke. 3. That in order to obtain a commercial success in producing anthracite coke, the utilization of the gas contained in the bitumen and bituminous coal must be a part of the process at the present price of anthracite coal. It may be interesting to state that, through the kindness of the Harrisburgh Gas Company, the writer was enabled to make an experiment on a larger scale: 260 lbs. or 52 per cent. anthracite dust, 150 lbs. or 30 per cent. bituminous coal dust, and 90 lbs. or 18 per cent. gas tar were taken, making a charge of 500 lbs., which was placed, after thorough mixture, in three ordinary cast-iron retorts. For four hours these retorts were subjected to the bright red heat employed in making illuminating gas in iron retorts. The coke resulting was perfect, though not hard enough for blast-furnace use. It was tried in a blacksmith's fire, and produced a very high heat, quite equal to that of the best soft coal fire, with the advantage of making a fire free from smoke. Were it possible to make anthracite coke on a large scale equal to what can be produced in a small way, there is no doubt that the vast hills of anthracite dust now cumbering the earth near the breakers would be utilized. The following mixture will make a solid, lustrous coke, provided the anthracite coal dust is finely pulverized and the bituminous coal and gas tar are thoroughly mixed before charging, and are subjected to a white heat for about one and a half hours:—65 per cent. anthracite dust, 25 per cent. bituminous coal dust, and 10 per cent. gas tar. The attendant loss of weight amounts to from 22 to 25 per cent. A good coking bituminous coal was subjected to a similar treatment as the above mixture, and the result was an inferior coke, notwithstanding the fact that some coal coked well in a blacksmith's fire.—*U.S. Metallurgical Review.*

Water and Sanitary Notes.

WE have been courteously supplied with copies of the scales of charges made by the Devonport Water-Works Company, and they bear out the statement which we made a fortnight ago, that the Company deal, on the whole, very liberally with their customers. They very properly indeed insist on supplying, by meter, every trade which consumes a large quantity of water; beginning with a charge of eightpence per thousand gallons for a minimum consumption of five thousand gallons per quarter, and ending with threepence per thousand gallons for any quantity over one million gallons per quarter. Compared with many towns in the North, where a great quantity of water is consumed for trade purposes, these rates look extremely low.

Bermondsey, we are sorry to see, still complains of want of water, and there appear to be good grounds for complaint; but it has not been satisfactorily made out whether the fault lies with the Company or with the consumers fittings. It may be that each must bear a share of the blame. The population of Bermondsey has increased very rapidly within the last ten years, and perhaps the mains which have been laid there are scarcely adequate to supply the quantity of water now required. There has been, besides, the unfortunate failure of the Nunhead reservoir, which was specially provided for the benefit of this district. The ratepayers who, last week, went as a deputation to Mr. Sclater-Booth suggested a constant supply as a remedy for existing evils; but this, we may take it, is impossible of application. In the first place, the Company are not in a position to give a constant supply; and, in the next, the defective fittings all over the district would probably, in a few days, empty the mains. The case, however, is one which seems to deserve to be inquired into. It is much to be regretted that many houses should be left without water for several consecutive days; and the cause of this should be ascertained, and a remedy applied. The Company, we are satisfied, would assist in the inquiry, and willingly do their best to remove the reproach which now seems to attach to them. The explanations they will presently give to the Local Government Board will, no doubt, reveal to us the true state of the case.

The Metropolitan Board of Works do not seem inclined to speculate on General Scott's process. They are willing, as usual, to allow the Company to make experiments at their own expense, if they can hold out reasonable hopes that they can succeed in purifying metropolitan sewage at a moderate cost. If, beyond this, General Scott is able to make a large profit by the manufacture of cement, no doubt the Board will let him have the sewage for a very small consideration. The inventor who will attempt to treat the enormous bulk of metropolitan sewage by chemical means must be a bold man, and we fear that General Scott would soon find himself with a large quantity of sewage cement of a doubtful quality on hand.

With moderate amounts of sewage, chemists appear to succeed very well, and the Native Guano Company would appear, at last, to be successful at Aylesbury. If the report before us be correct, the Company must be doing a large manure business, exporting very considerable quantities of their produce to Italy and the South of France. It strikes us as odd that the price of the manure, during all the years that we have known it, has never been more, and never less, than £3 10s. per ton.

The Stockton and Middlesbrough Corporations having paid the Water Company for their undertaking, are now seriously exercised over the duties which the Act they have obtained imposes upon them to commence, within six months, new works to furnish a supply from the Balder and the Lune, in substitution of, or in addition to, that from the Tees. The cost of these works is estimated at from £800,000 to £1,000,000, and they have to be completed within eight years, so that the Corporations will have to incur an outlay of about £100,000 a year. It is no wonder that ratepayers who reflect upon the matter stand somewhat aghast when they look at the prospect. The present net revenue of the water undertaking is £29,849, leaving a considerable deficit, which has to be made good by a public rate. The natural development of Stockton and Middlesbrough is hardly likely to bring sufficient business to enable the Corporations to derive an income from the undertaking sufficient to meet their ever-increasing liabilities. Thus heavier and heavier rates will have to be imposed, and we notice that a two-shilling rate is anticipated. There is one course open to the Corporations—they may go to Parliament to be relieved of their obligation to immediately commence their new works, and continue, for some years to come, to supply the much-abused water from the Tees. We believe that they have already discovered that the water which they formerly denounced as diluted sewage, dangerous to health, is now a wholesome fluid, fit for all

domestic purposes. So, probably, they will continue to supply that delicious drink as long as they can.

The proprietors of the *Sanitary Record* conceived the idea of making an examination of the water supplied to what are called our health resorts, and confided the analytical work to Mr. G. W. Wigner, F.C.S., who has collected the analyses scattered through the pages of the journal into a pamphlet.* The book bears evidence that the analytical work has been very carefully done. Believing, however, as we have very often said, that the character of a water supply has little or no influence on the health of those who partake of it, we feel bound to caution our readers against attaching too much importance to the results of the chemical analyses as stated in this book. It is very proper, however, that the public should know the nature of the supply when they are deliberating upon the choice of a holiday resort, for it is a sudden change from one kind of supply to another—and we here refer mainly to the saline ingredients of a totally different character—which is apt to produce disturbances to health. To take an extreme case (but we will not mention names, for that might land us in long disputes), imagine Paterfamilias taking a family of young children, who are all water-drinkers, from this Metropolis, where the solid ingredients of the water amount to only about 23 grains, and the chlorides are small in amount, to a so-called health resort where the total solids in the water supplied are 228·80 grains, and the chloride of sodium 182·87 grains per gallon. What can be expected to follow but gastric disturbance, which must tell badly on the health of the children? We put, of course, an extreme case, but it shows to what London visitors to watering-places are exposed. Of organic matter and albumenoid ammonia we say nothing, for we regard these as bugbears. There is no evidence that, in the absence of specific poisons—and in that case only evidence of the most shadowy character—they do the least harm. A change from a hard to a soft water, or *vice versâ*, does, we know, produce discomfort. Animalculæ have a disagreeable appearance in water, but are probably quite harmless. We have swallowed a great many in our time, and do not believe we are any the worse for it.

The work projected by the proprietors of the *Sanitary Record*, we may say, has been ably carried out by Mr. Wigner, and we may strongly recommend the study of this book to all who, fearful about the matter, before deciding upon their holiday resort, are anxious to know the character of the water supply. If we represent the matter as of smaller importance than is commonly supposed, it is for reasons given above.

Sales of Gas Shares.—Last Tuesday an original share in the Louth Gas Company was sold for £56, and £50 of B stock for £46. There were recently sold 24 shares (£25) in the Farnham Gas Company, realizing in the aggregate £978, or an average of £41 per share. Last Wednesday there were sold by auction eleven fully paid-up new shares in the Colchester Gas Company, when three shares were purchased for £27 5s., and two others for the same amount, while two lots of three shares realized £27 10s. each lot.

Lectures on Heating and Cooking by Gas.—At the invitation of the Pinner Gas Company, Mr. Henry Gore, on the 24th and 31st ult., delivered two lectures in the Public Hall, Pinner, on the "Use of Gas for Lighting, Cooking, and Heating." The very large audience which attended the second lecture proved the interest excited. On the latter occasion, "Cooking by Gas" was the topic, and all present appeared highly delighted with the humorous but instructive way in which the lecturer treated his subject, and especially by the numerous striking experiments illustrating the remarks. The way in which Mr. Gore answers the objection that the gas must contaminate the meat cooked by it, was a very telling experiment. During the lecture a leg of lamb was roasted, a pie baked, chops grilled, and bread toasted; and, judging from the eagerness displayed to examine and taste the viands prepared, every one appeared perfectly satisfied with the success of the process. Such lectures as these should prove of immense advantage to gas companies in promoting the extension of the use of gas. We understand that Mr. Gore will repeat these lectures in several other localities.

The Rawfolds Water Company and the Liversedge Local Board.—On Monday, the 29th ult., at the ordinary meeting of the Liversedge Local Board, held under the presidency of Mr. John Cragg, a letter was read from the Rawfolds and District Water Company (with whom the borough have been in treaty a considerable time for the purchase of their undertaking), stating that in order to avoid litigation and trouble, they had decided to accept the offer of the Board, and to sell their plant for the price of 35s. per share for every fully paid-up share of £1, and 8s. 9d. per share for every partly paid-up share of 5s. There were 4690 of the former and 2322 shares of the latter. The amount to be paid by the Board to the Water Company will be £9223 7s. 6d. The purchase is to be completed either on Oct. 1 or Jan. 1 next. The Directors expressed their confident opinion that the undertaking was worth far more than the price named, but they desired to promote the prosperity of the township, and hoped the Board would throughout the transaction reciprocate those sentiments. A draft agreement prepared by the Clerk was approved, and ordered to be forwarded to the Water Company. The Clerk recommended that the Board should make application to the Local Government Board for powers to borrow £10,000, with which to complete the contract, but this matter was deferred to a future meeting.

* "Sea-Side Water; an Examination into the Character of the Water Supply at the Watering-Places of England and Wales. Abstracted from a Series of Reports prepared for, and published in, the *Sanitary Record* during 1877-78." By G. W. Wigner, F.C.S. London: Kent and Co., 1878.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

MR. METHVEN'S NEW STANDARD FOR DETERMINING THE ILLUMINATING POWER OF GAS.

Sir,—It was my intention, immediately on the publication of Mr. Methven's paper with the above title, in the columns of the Journal under date of the 16th of July, to supplement the remarks which I made at the Meeting of the British Association of Gas Managers by a few further observations; because, the more I thought about the proposed standard, the more I became satisfied that it was untrue in theory, and untrustworthy, notwithstanding the apparent concordance of Mr. Methven's experiments. Circumstances have, however, prevented me carrying my intention into effect until now.

Mr. Methven says that he has "discovered that portions of flames of gases of varying qualities, ranging in illuminating power between 15 and 35 candles, consumed so as to effect perfect combustion by similar burners, are equal in illuminating power." In Table No. 1 he shows that the portions of such flames which approximate in value to each other are found at different heights from the top of the burner, the zone of maximum intensity for the cannel gas being 3·10ths of an inch lower than that of common gas; and Mr. Methven attributes the variation or difference to two causes—first, the alteration in the width of the flame; and, secondly, the bright portion of the flame, which is easily observed at the edge of an Argand burner. This explanation is based on observed facts, and is satisfactory enough as regards the variation in illuminating power, but what does it tend still further to prove? Why, surely, that flames of the same length, produced by the burning of gases of different qualities, do not give equal quantities of light, and therefore that no parts of the flame of common gas can be equal to the corresponding parts of the flame of cannel gas. This is, in truth, admitted. The variations or differences in the width or diameter of flames produced by different gases is a fact, so are the variations or differences in the brightness of the "edges." It is to be remembered that the edge of an Argand flame extends *all round*—it is the circumference of a cylinder—and any variation affects those parts of the flame which are opposite the slit in the screen as much as it does those parts which are concealed from the photometer disc. Such being the case, how is it possible to believe that, with flames produced from gases of different qualities, the quantities of light which pass through a slit in a fixed position can be constant?

It is to be regretted that Mr. Methven has not given in Table No. 1 the illuminating value for every section of the flames from one to ten; the total value of each would then have been known. As far as the information which is given goes, it tends to show what I have believed and asserted for years—viz., that the mere determination of the lengths of flames is by no means to be depended upon as indicative of illuminating power, with gases of different and unknown quality and composition, although under certain conditions the jet photometer, in all its varieties, is, for approximate determinations, a most valuable instrument.

It may be argued that the variations in the amount of light passing through the slit in the screen are very small—almost inappreciable. Such may be case (although it is difficult to believe) but that variations do take place must be true.

Mr. Methven objects to Mr. Sugg's illuminating power meter, and to the pentane gas of Mr. Vernon Harcourt, on the score of "difficulty in regulating the height of the flame." Yet, strangely enough, this note is found under Table No. 2: "Flame of each gas in screen burner adjusted to the height of 3 inches." Now, surely if an adjustment be possible in one case, it cannot be *difficult* in others. Truly, Mr. Methven says that his system "is not dependent on the height of the flame being accurately adjusted"—a position from which, with all possible respect, I absolutely dissent, not only because a variation in flame length raises or lowers the zone of maximum luminosity, but also because if it were admitted that the adjustment of flame length were unimportant, a looseness of practice might (I almost said *would*) ensue, and lead to grave irregularities. If a gas of constant quality were used instead of candles, there would be no serious difficulty about length of flame adjustment; but then, possibly, it might be found that, as Mr. Harcourt proposes, it would be best to allow the rays of light to pass freely to the photometer disc without intercepting any of them by means of a screen.

Mr. Methven says that his standard possesses the advantage "that the quality of gas may be arrived at by one single observation," and he appeals to the *averages* in Table No. 2, and calls attention to the fact that those averages do not differ more than 2·10ths of a candle; but does it not appear that "one single observation" might mislead when the first pair of opposed figures gives cannel, 6·7; and common, 7·25; or a difference of 0·55, or more than half a candle; while the fourth pair shows a difference of 0·65 of a candle? It is true that the other pairs run very close, but that the discordant results should have arisen with Mr. Methven himself, shows, I think, that more care and attention must be given in the use of his standard than he states, and it certainly shows that more than *a single observation* is desirable. I mention this matter, however, more as an indication that I have looked well at the figures than as an objection, for it would be of little consequence, and by no means detract from the merit of a *good* standard, if several observations were necessary.

In conclusion, I must express my personal thanks to Mr. Methven, and I am sure that all the members of the profession who have heard or read the paper must, in their hearts, have done the same, for the labour he has taken, and the interesting particulars which he has furnished through the British Association of Gas Managers.

F. W. Hartley.

55, *Millbank Street, London, S.W., July* 29, 1878.

THE WATER SUPPLY OF DEVONPORT.

Sir,—In the Journal of the 23rd of July, under the heading of "Water and Sanitary Notes," you published a paragraph relative to the recent alterations in the charges made by this Company; but as your correspondent appears to have been misinformed on several points, I

should esteem it a favour if you would kindly correct the same in your next issue.

1. No extra charge is made to a grocer, who pays the domestic rate only.

2. A chemist is charged 5s. per half year, and not 3s. per quarter.

3. The Company charge for gardens watered by water-pots, such charge being one-half of the charge for the same gardens watered with hose.

For your information I forward you copies of this Company's charges, which, on comparison with those of other companies, will, I think, be found to be much below the average.

I should mention that the Company bring the water from the Forest of Dartmoor, a distance of 32 miles, and that during the past two years they have spent £40,000 in substituting a constant supply of *filtered water* for an intermittent supply of unfiltered water; and as the dividend paid to the Shareholders is only 3¼ per cent. per annum, I think you will see that the charges are not unreasonable.

There is one other point which I find I have omitted to refer to—namely, the charge of 9s. per annum as meter-rent. This charge is made for a 100-gallon Parkinson's meter, and, I believe, is the same as charged by all companies using these meters. The net cost of the meter, without the cost of fixing, is £3 8s.

H. Francis.

Devonport Water-Works Offices, 22, Ker Street, Devonport, July 27, 1878.

STOPPAGES IN INLET-MAINS TO GASHOLDERS.

Sir,—In your issue of July 23, a question is put by "7," about stoppages in inlet-mains to gasholders, which I think I can answer.

The stoppage is very likely due to naphthaline, which often, on warm days, becomes detached from the sides of the vertical pipe, and falls suddenly down. So it happened lately here. We tried warm water and even steam, but they only made the stoppage worse. We succeeded wonderfully, however, by the following process:—We filled up the inlet-pipe with petroleum, and put into the bottom of the pipe a small steam-pipe, ended by an elbow. We then let in steam, and made the petroleum boil for about an hour, after which we pumped it out in its hot state, and the inlet-pipe was found quite clean.

A Belgian Gas Engineer.

GAS COMPANIES AND ALTERATIONS IN STREET LEVELS.

Sir,—The Local Board of Health of the district in which my Company are authorized, by Provisional Order, to manufacture and supply gas, have recently lowered the level of one of the footpaths so considerably as to expose the service-pipes, thus necessitating their being lowered; and, in some instances, where the level has been reduced by two feet or more, syphons must be fixed.

As it is a point of considerable importance to Gas Companies, where these so-called road improvements are being made, to know whether the Local Board should bear the expense of altering the services in such cases, I should be obliged if you or any of your correspondents would favour me with any such instances which may have come under their notice.

Secretary.

WATER-RATES IN THE METROPOLIS.

Sir,—You were good enough to insert, in the last number of your Journal, a letter from me on the subject of the Metropolitan Water Companies charges. In relation to this subject, I should like to be allowed to make a suggestion, which, in your columns, would have a better chance of receiving attention than if it appeared anywhere else. It is this, that on the backs of the demand notes served upon householders, when the water-rates become due, should be printed the rates which the particular Water Company are authorized by Parliament to charge, and a statement of how the actual charge is made up—that is to say, that the rate is so much per cent. upon the rent or annual value of the house, with so much for each water-closet, and any other additional item of charge which there may be.

Every one has, from time to time, heard complaints of the seemingly arbitrary charges of the Companies, consequent on the occasional increase of the water-rate, without any explanation, and without any knowledge on the part of the householder of what the basis of charge is. In the water district in which I live, for instance—that of the Southwark and Vauxhall Water Company—the rate of charge has, within the last ten years, been twice increased, the present rate being, I think, the maximum authorized; and, although I happen to be aware that the Company have the right, and are fairly entitled to charge what they do, this is not the case with the majority of householders. They only see that the charge is varied from time to time (always in the direction of increase) at the mere will of the Company, and there is general dissatisfaction with what, in the absence of knowledge, appears to them an arbitrary proceeding.

In all other claims made upon an occupier he has full information given him. In the case of the local rates, he is informed what his assessment is, and what is the amount of rate in the pound, and he thus sees how the amount called for is made up. In the note of the gas collector he finds stated the amount of gas he has consumed—the accuracy of which he can ascertain for himself by looking at the meter-index—and the price per 1000 feet, and there is no doubt in his mind as to the correctness of the charge. The water-rate is the only claim made upon a householder in respect of which no information is given, and, when the rate is increased, he is at a loss to know why, or on what authority, and on what basis the rate is calculated.

I think that by giving to the householder, when he is called upon for payment, the information which I suggest, the dissatisfaction and uncertainty which are now often felt would, in a great measure, disappear.

A Householder.

Clapham, Aug. 2, 1878.

Reigate Gas Company.—The annual meeting was held on the 15th ult.—Mr. J. Payne in the chair. The report stated that the profits of the Company amounted to £1805 13s., out of which the Directors recommended the usual dividend of 5 per cent. for the half year. The report was adopted, and the retiring Directors, Messrs. Payne and Relf, re-elected. The dividend recommended in the report was declared, and the proceedings closed with a vote of thanks to the chair.

Parliamentary Intelligence.

HOUSE OF LORDS COMMITTEE.

Thursday, July 18.

(*Before Earl* Spencer, *Chairman; the Duke of* St. Albans, *Earl* Bathhurst, *Lord* Wrottesley, *and Lord* Truro.)

DURHAM WATER BILL.

Mr. Littler, Q.C., Mr. Michael, Q.C., and Mr. Milvain appeared for the promoters, the Water Company; Mr. Venables, Q.C., and Mr. Balfour-Brown for the Corporation; and Mr. Dangerfield, solicitor, for the private petitioners, Rev. William Greenwell and Mr. George Gradon.

Mr. Littler, in opening the case for the promoters, said that this was a Bill promoted by a joint-stock company, called the Durham Water Company, for the purpose, amongst other things, of enlarging their works. Under ordinary circumstances, the Bill would seem very simple, but there were some special circumstances in the case, which, however twisted, the Committee would not find much difficulty in dealing with. The Company were established in 1847 for supplying the city of Durham with water, which at that time was obtained from springs and from the River Wear, from which it was brought in carts and pails. The city was absolutely without any regular water supply till a number of gentlemen of the city, not so much for their own personal gain as for the purpose of supplying the inhabitants with an ample supply of water, formed themselves into a joint-stock company, and laid the mains necessary at the time, taking the water from the River Wear. Since 1847, additional works had been required from time to time, and they had been constructed with a view of affording a continuous supply of water, and there was not the slightest intention to alter the continuous supply which already existed. The Company had two mains from the service reservoir to the city to avoid risk of accident, and works had been provided to get the water to the highest part of the city. The main had also been extended even beyond the city boundary, and the North-Eastern Railway Company had been supplied. It was noteworthy that, from 1847 up to the present time, the city had been singularly free from any disease which could be attributed to the water supply. During the whole of the time there had only been one outbreak of an infectious or contagious nature, and that was small-pox, which it was obvious was not caused by any defect in the supply of water; besides, not one single complaint had been made concerning the quality of the water. It had now become necessary for the Company to increase their works. They wanted an additional subsiding tank and service reservoir, mains, and so forth; but they would hardly be justified in going to that expense were they not protected in the fullest way by parliamentary authority. They were only a joint-stock company, having no such authority, and therefore it became most necessary, before spending more money, that they should have the protection of Parliament; and, inasmuch as they had expended a considerable amount of money, and desired to spend more, they wished for proper protection for their property. Under the 11 & 12 Vict.—the Public Health Act—the Local Board of Health had power to supply the city with water, but they had not done so; therefore the Committee would see that there had been nothing particularly wrong with the supply, otherwise the Local Authorities would most assuredly have exercised their power. No such suggestion had ever been made by anybody up to the present time; in fact, everybody in Durham had been perfectly contented with the supply. The Committee would not be very much surprised that, so far as the other House was concerned, the Bill, with the exception of the opposition of the North-Eastern Railway Company, was unopposed. Subsequently the Corporation were stirred up to oppose, before the House of Lords, the Bill, which was certainly promoted for the public good. He advisedly said "stirred up," because the Bill was originally considered by the Corporation, and a meeting had been called on the 6th of February to consider whether or not it was worth while to oppose the Bill at all, and whether it should be opposed *in toto* or simply as a protest. The Committee would be satisfied that at that time, at all events, there was no particular agitation or feeling in the city against the Bill, because on the day that this matter was to be considered by the Corporation, a quorum of the body never turned up; thirteen formed a quorum, and only six put in an appearance. There was another circumstance which showed that there was no public feeling against the Bill; while, on the other hand, it showed that the Company were doing their duty as regarded the public, because they desired that proper restrictions should be inserted in the Bill. In the early part of this year a Committee of the Corporation were appointed to consider the subject, and they had an interview with the Company, but never suggested that the source of supply was bad; they never suggested that anything was wrong except certain details, and with regard to these details they mentioned what it was they required. The Company were certainly not enamoured of the proposals of the Corporation; they were, however, desirous to do everything they could in the interest of the public, and it was quite clear they did not wish to make an exorbitant profit by the undertaking, because for some time after their establishment the dividend they paid was only 9 per cent. (whereas they could pay 10 per cent. if they were made into a parliamentary company), and their average dividend since their formation had only been a little over 6 per cent. The Special Committee left the Company, and not until two days ago did the Company know that they had made any report to the Corporation. That would show the Committee that there was very little objection to the Bill on the part of those who were the protectors of the public interest. The Committee, however, had reduced their objection to writing, a copy of which was in his hand.

Mr. Venables denied any knowledge of such a document.

Mr. Littler said he should like to know whether there was not a copy of this particular document in the hands of the Corporation. [An original document, signed by the Mayor, Edward Peele, was here handed in.] He was not sorry this had taken place, because it showed the character of the objections to which the Company had been subjected. The suggestions of the Committee were in the handwriting of one of the clerks in the Town Clerk's office. The report was signed by the Mayor, and he supposed why it was never submitted was because the Corporation would not take any trouble in the matter. It showed what was the character of the opposition when counsel were not instructed in the matter until the Bill had passed through the Commons. He did not know whether many of the Owners of property in Durham were Shareholders in the Company, whose dirty water was to be seen on that table [specimen handed round]; but after the Bill passed through the Commons, some one suggested that the Company could get better water from the Weardale and Shilden Company. An agitation was got up, and the Committee knew how easy it was to bring about such a thing; how zealous in agitating were some persons who had not to pay the expenses entailed. It was declared that the water supplied by the Company was not clean and good, and that good water could not be procured from the Wear. This was not true, for every one in Durham was drinking it, and the death-rate of the city was as low as 22 per 1000. There had been a petition presented to the House of Lords on the subject of the Bill—not, however, praying to be heard—and a memorandum had been presented to the noble Lord the Chairman of Committees (Earl Redesdale), urging him to make inquiries into the matter. He did so, and learning that

there were a large number of objectors to the measure, he, in the exercise of his discretion, decided to postpone the Bill until after Easter, and let it come before Committee in the ordinary way, the Corporation being allowed to present a petition against it. In their petition the petitioners referred to the question of the capital of the Company. The Company had never paid maximum dividends, and if the new capital was worth some premium, why should not the Shareholders have the benefit of it? The first objection, however, which was made to the Bill was merely a matter of clauses, and could be considered after the preamble had been proved. The petitioners objected to the use of water from the Wear. Well, there was a specimen of the water now before the Committee, and it would speak for itself. An eminent analyst would be put into the witness-box, and would state that, with Dr. Frankland (one of the best known authorities in England), he had examined the water, and had found it absolutely unexceptionable as drinkable water. Then the Committee would hear from the witnesses that the moment the Company got their Bill through, they would have a direct interest in preventing the pollution of the river; it would be their duty to do so. It was stated that the water was impregnated with copper and iron pyrites, with lead refuse, and washings from collieries, but this was all inaccurate; and it was further stated that the Bill ought to be abandoned, as a source of supply of some purer kind should be found in the district. That was a sort of alternative scheme, without telling the promoters what the scheme was to be. If the Company were to go to the moors for their water, a charge of some £90,000 would be imposed upon them, and yet the petitioners were complaining of the charges, and asking for them to be lowered. At any rate, on this point of the pollution of the river and the purity of the water, it was one for consideration when they came to the clauses. If the Committee were of opinion that the supply was not satisfactory, the promoters would have to consider how they could improve it, or get a better one. The petitioners also said that if the Company took a larger quantity of water from the Wear they would interfere with its volume. That again was a matter of clauses; and he would point out that the Wear Commissioners, who were more interested in the river than any one else, had considered the measure, and were not opposing it. It was not until last April that this opposition was ever heard of. The petition had, no doubt, been signed by a large number of persons; but he could not help believing that it had been signed under some misapprehension of the facts. At any rate, he would call ratepayer after ratepayer, and consumer after consumer, who would tell the Committee that they had taken the Company's water for years without having to make the slightest complaint. Amongst others he would call before them a gentleman in Her Majesty's service—the Governor of Durham County Gaol—who had held the office for many years, and had 500 or 600 prisoners daily under his charge. This witness would tell them that the prisoners had been so free from disease that the death-rate was as low as 12 per 1000. Besides this witness, engineers and official gentlemen would be called, and he had no doubt that in the result the Committee would be satisfied that the preamble of the Bill had been proved.

Mr. *Edward Peele*, examined by Mr. LITTLER.

I am Mayor of Durham. The document produced, and which has already been referred to, was signed by me, and is in the handwriting of one of the clerks in the office of the Town Clerk. The Committee appointed by the Corporation were instructed to make remarks on the Bill of the promoters, and lay their objections before the Directors of the Company. We had an interview with them, and they practically assented to the suggestions we made.

Mr. LITTLER: How was it that this report was not presented to the Corporation?

Witness: I read one morning in the newspapers that the Bill had passed a second reading in the Commons, and telegraphed to the Parliamentary Agent for the Corporation, and asked him if that was correct, and also when was the last day for presenting a petition against it. He informed me that the Bill had been read a second time, and that the time for presenting a petition had expired some time before.

Examination continued: I cannot say whether the alterations that we suggested to the Directors would have pleased the Sanitary Committee of the Corporation; but there were some members of the Committee who met the Directors with us. The agitation against the Bill was commenced before the first meeting of the Corporation in December. It has been going on for some time, and during the 66 years I have been in Durham I have never known such ill-feeling to exist as has arisen over this matter. I have never heard any complaints of the quality of the water supplied by the Company. I have several tenants, but none of them have complained.

Cross-examined by Mr. VENABLES: There was a meeting of the Town Council on the 15th of December last, at which a Committee were appointed to consider the Company's scheme. The next meeting on this subject was on the 6th of Febeuary this year. I never called a meeting of the Committee, and I do not know that they ever met. It was resolved in the Council that the Committee for considering the Water Bill be empowered to form themselves into a sub-committee to meet the Directors of the Company for the purpose of getting them to reconsider the Bill, as printed, on the points that did not meet the views of the Council, and to obtain modifications of it, and it was also resolved to oppose the Bill. I saw the statement as to the second reading of the Bill in a Durham paper, and went at once to the Town Clerk, and got him to telegraph to London. Six out of the thirteen members of the Water Committee went to the Directors of the Company, and they said they would consider the suggestions we should make.

Mr. VENABLES: Then these suggestions were not the report of the Committee to the Corporation?

Witness: No; it was the report of a special committee.

The Corporation never saw it; consequently Mr. Littler was entirely mistaken when he represented this as being the report of the Committee to the Corporation?—If he did do so he was mistaken, as it was never submitted even to the Committee, and for this reason we had to have a special meeting of the Committee to receive it, and we could not get a quorum.

Cross-examination continued: The Town Clerk and I drew up the memorandum for the purpose of having it approved by the Committee. I have not attended any meetings of the Corporation on the water question since the 6th of March, because I was grossly insulted, and had to vacate the chair. Several complaints were made, and I am sorry to say that all the members of the Corporation acquiesced in what was said. The Town Clerk was not able to get copies of the Bill, and he and I were charged with keeping them back.

Mr. VENABLES: What you were charged with was that you had neglected to take steps in time, so that the Corporation might, if they chose, oppose the Bill?

Witness: No; the Corporation took the ground from under their feet by rescinding their resolution. If they had chosen they might have opposed the Bill, as they had weeks and weeks to do it in.

Cross-examination continued: The Corporation have agreed to oppose the Bill; but not unanimously. We never are unanimous about anything. There was a public meeting of the ratepayers on the 30th of May, at which I took the chair. There were a great many influential persons present, and resolutions were passed unanimously opposing the Bill. I am supplied with the water of the Company. I use four kinds of water at home, and that of the Company is rather hard, and will not draw tea well, therefore I get what I want from a well a mile and a half from my house. I, however, drink the water that is supplied by the Company every night and morning.

By Mr. DANGERFIELD: On the 6th of February the Corporation passed four resolutions, authorizing an opposition to the Bill; but at the March meeting it was resolved that the minutes of the previous meeting be confirmed, with the exception of the resolutions relating to the Bill. I have many tenants in Durham, but have never heard any complaint from them respecting the quality of the water.

Re-examined by Mr. MICHAEL: At the meeting in February it was resolved to oppose the Bill, and in March the motion was struck out. At the request of the Company, our objections were reduced to writing, and the Company said they should have their best consideration, remarking that there did not seem to be much between us.

By the CHAIRMAN: When the minutes were rescinded there were 18 members of the Corporation present out of 24.

Mr. *William Boyd*, examined by Mr. MICHAEL.

I am a surgeon, practising at Durham, and am Deputy-Chairman of the Water Company. At the time of the formation of the Company there was no regular supply of water. In the Market Place, for instance, there was a fountain, but that has been since entirely lost. There were also wells and springs, but generally the supply of water was very insufficient. The original capital of the Company was £12,000; but it is now £32,000, and I believe it is all paid up. The Company have complete works, and water can be supplied to the highest parts of the town. From time to time the water has been analyzed, and it has always been found to be most satisfactory. The Directors have done all in their power to see that the water supply is excellent. I am medical officer to the County Prisons, where there are on the average 609 prisoners daily. The prison has been entirely supplied by the Company since 1848, and there has been no disease amongst the prisoners which can be attributed to the water supply. There have, in fact, been only two deaths from typhoid. Six thousand prisoners pass through the prison yearly, and if there was any injurious ingredient in the water, it would, no doubt, show itself. Among the large number of persons in the town, too, there has been no epidemic which could possibly arise from a bad water supply. There has only been one outbreak of small-pox which took the form of an epidemic. Durham has been as free from typhoid as any other town of similar population—15,000. The mortality during the last eight years, except in 1871—the year in which small-pox broke out—has been at the rate of 22 per 1000; and that I consider a very small per centage. If there had been any impurity in the water, I should certainly have expected a larger death-rate. I have been the medical officer at the Union and the Workhouse since 1834. During this time there has been an outbreak of Irish fever, which was entirely free from any epidemic disease. I do not think there is any impurity of the water arising from the lead mines; if there is such impurity, it is such as never could be detected. The water, in fact, is as pure as any in the neighbourhood. The average dividends of the Company since their formation have been 6½ per cent. When the Bill was commenced in the House of Commons, there was little opposition to it; it was practically unopposed. I attended before Lord Redesdale and explained various objections that were urged against the measure.

Cross-examined by Mr. VENABLES: There have not been many complaints as to the quality of the water; but people have complained occasionally. I have not analyzed the tributaries of the Wear, or the Wear itself, but am satisfied with the quality of the water. In times of flood the water is certainly somewhat coloured. In February, 1870, at a meeting of the Corporation, I do not recollect having said I was dissatisfied with the water supply. The Company certainly have searched for other supplies of water besides that they now possess. If they could get water from the borings at Shincliffe Bridge, they would save considerable expense in the matter of pumping, and would satisfy a great many people who prefer spring water. They would meet the prejudice of a great many people. There have not been annual or very frequent resolutions before on the impurity of the water. I only remember two occasions before this, when the matter was brought before the council. There has been typhoid fever occasionally at Durham. I do not know that, as a medical man in Durham, I am alone in the opinion that the water is fit to drink. I do not know that the medical men have signed a paper concerning the impurity of the water. I have not seen such a paper, and was not asked to sign it. I agree with the assertion that if cholera or typhoid fever broke out in any of the great masses of population on the banks of the Wear, and the sewage was sent into the river, the germs of disease would spread to Durham. The medical gentlemen who signed the declaration are all influential men, but there are other medical gentlemen in conjunction with myself who regard the water from the wells as pure and fit for human consumption.

Re-examined by Mr. MICHAEL: If this fear as to the impurity of the water were well grounded, there has been plenty of opportunity for the Local Authorities to remedy the impurity by the establishment of waterworks for themselves.

Colonel *Armstrong*, examined by Mr. MICHAEL, said he had been the Governor of the Gaol of Durham for the last eleven years. The prison was supplied with water by the Company. Last year there were 6607 prisoners in the gaol. They had no epidemic disease in the prison, and no disease, in fact, which could be attributed to the water. For all purposes he considered that the water was very good. He and his family always drank it.

Mr. *William Goundry*, rate collector and house agent, said he had the means of knowing a large proportion of the people of Durham. Before the Company were established, the water supply was very insufficient. He and his family drank the water, and he had never had any disease in his family attributable to impure water. He had heard no complaints as to the quality of the water.

Mr. *William Malcolm*, a glass and china merchant, said that he and his family had used the Company's water ever since they undertook the supply, and he had no cause to complain of it. He dealt in filters, besides glass and china, but there was very little call for them.

Mr. VENABLES said if it would serve the promoters he was quite prepared to admit that many of the inhabitants of Durham had survived the use of the water.

Mr. MICHAEL said he had 50 witnesses of the same class, because he had thought it necessary that the opinion of the inhabitants should be taken respecting the quality of the water supplied to them by the Company. He would, however, go on to another class of evidence.

Dr. *Charles Meymott Tidy*, examined by Mr. MICHAEL.

I am a professor of chemistry and public analyst, and have had large experience as to the water supply of London. In company with Dr. Frankland I visited Durham for the purpose of analyzing the Company's water. We made separate reports as to the quality of the Wear water, but

we concur in our opinion of it. It is a water of unimpeachable quality. The elements of the water are such as compare very favourably with those of the best water supplied to London—that of the New River Company. Sewage cannot exist in water without our being able to perceive it. The result of our examinations proved that not only had sewage disappeared, if there had been sewage, but the whole of the product of decomposition of sewage had disappeared, if there had been an entrance of sewage into the water. The water in the river is perfectly clear and bright. I took samples of the water as supplied by the Company to the town, and they show it to be very clear, beautifully bright, and exceedingly pure. Chemically, it is a very pure water; and, regarding it from a medical point of view, it is perfectly wholesome, and excellently well fitted for domestic purposes. I made myself acquainted with the district between Bishop Auckland and Durham, by carefully inspecting the whole of the district. One of the chief places between the two is Spennymoor, a place containing 5000 inhabitants. I examined the outfall of sewage, or what is called sewage, from Spennymoor, and there was no personal sewage at all in it, but it was simply a little dirty water—perhaps house-washings; and, as regards Spennymoor, I saw works in progress whereby even the dirty water will be kept out. I do not think there are any water-closets there. I took samples of water from the Wear at Bishop Auckland, at the point where the sewage enters the river. The result of my analysis of the water taken at this point is that the water is not very pure. I examined the banks of the river all the way down. There are certainly some spots of the river which I did not see, but I inspected the river at all the principal spots. The vegetation a short distance from Bishop Auckland becomes more beautiful, a fact which shows clearly that there is no sewage pollution in the river. As regards the state of the banks, I admit that at Bishop Auckland, and for some distance beyond the river, there are distinct signs of darkening on the sides of the banks, and on some of the stems of the trees growing on the side of the river; but when I got within a mile from Bishop Auckland the whole of this darkening disappeared, and for the remainder of the course I saw no signs of it. I, however, took a sample below the junction of the River Gaunless. This showed a very large decrease of organic carbon. The Gaunless brings down some lime, and an increase of sulphuric acid. This influences the hardness of the water, but it does not influence its purity. It is really a great advantage to have its presence in the water. I also took another sample from Byers Green, where I found a slight rise in the organic carbon. In none of the samples of the water did I perceive any lead, iron, or copper; in fact, there was no sort of poisonous metals present. It is certainly, however, rather hard water. The next place where I took a sample of water was at Tudhoe Ford, and I found that in that the organic matter had greatly decreased. Even when there is flood water in the river, the relative qualities of the ingredients will not be materially affected. There may be a little vegetable organic matter, but nothing which will influence the purity of the water. A sample taken at the junction of the River Browney, I found to be much better, so far as organic matter is concerned, than the other samples. It is perfetly clear that a certain amount of sewage flows into the river at Bishop Auckland; but I am quite convinced that all trace of it disappears a short distance from Bishop Auckland—in fact, the water supplied by the Company is perfectly free from present and also from past sewage contamination. I examined the water of the Rivers Gaunless, Browney, and Tursdale, and they showed considerable purity. As to the question of fish, I saw a large quantity in the River Browney, and understood from a resident that they were always very plentiful.

Cross-examined by Mr. VENABLES: I am not aware that the Fishery Association in the neighbourhood has been dissolved, because it was not thought worth while to fish there. I examined the river on the 18th and 19th of June. At the time there was no flood whatever. Of course, if there had been, the analysis would not have shown so good. I am aware that certain gentlemen have analyzed the water, and I have heard there is some prejudice against it. It seems to be a case of sentiment *versus* fact. The gentlemen who have examined the river failed to detect sewage, and even if it did exist, they failed to show it would do any harm.

Mr. *William Crookes*, examined by Mr. MICHAEL.

I am a Fellow of the Royal Society, and have taken great interest in water supply. I have examined the water supplied to the City of Durham, and found no trace of lead. In the water there was no copper or iron present, and the result of my analysis is that it is very excellent water. As compared with the water supplied to London, it is certainly quite as good. I found a little blackening in the water near Bishop Auckland, but within a mile of it all sewage had disappeared. The water is in every way fit for consumption by the people of Durham.

Cross-examined by Mr. BALFOUR-BROWN: I took my sample after three or four weeks of dry weather, about the 28th of June. There are a large number of lead mines in the watershed. In the water coming from a lead mine put into a settling-tank some amount of lead is deposited. A flood would carry lead along for a short distance, but I do not think there is any danger of lead being carried to the pumping-station of the Company. It is possible, but not likely, that it may occur, as the pumping-station is 40 miles from the mines. As a rule, there is nothing deleterious in collieries. I have not made any special analysis of the colliery water, but have analyzed the tributary streams into which that water flows, and in a river such as the Wear, oxidation of sewage will take place in a distance of a mile or two. The river has a shallow, rocky bed, and the water falls over innumerable natural weirs. There are few rivers like it. The impurities that run from the Browney hardly make any difference in the quantity of the solid matter in the Wear.

Mr. BALFOUR-BROWN: Are you of opinion that medical analysis gives a complete test of impurities in water?

Witness: It would point out whether or not there was anything deleterious to health in the water.

Dr. *William Odling*, examined by Mr. MICHAEL.

I am a Fellow of the Royal Society, and Professor of Chemistry at Oxford. I have paid great attention to matters affecting the public health. I have examined specimens of the water from the Company's intake, and from other parts of the Wear, and have come to the conclusion that, although it is rather hard it is very wholesome. Supposing there were any germs of disease in the water, I could not imagine a single case occurring, in which chemical analysis would fail to detect them. I have never heard of such a case. The mere fact of the water having been supplied to a large population negatives the idea of any sewage being present. In regard to organic carbon, the water supply to Durham corresponds with the London supply. There is no metallic poisoning in the water.

Mr. *Pattinson*, the analyst for the county of Northumberland, said he was convinced that there could not be any sewage contamination in the water of the Wear without his being able to detect it, and he believed there was no such contamination. He should certainly pronounce it as being very excellent water.

Mr. *Edgar*, analytical chemist, said he had made an analysis of the waters of the Wear and its tributaries. It was excellent water for all domestic purposes, containing no objectionable matter.

Mr. *Thompson*, manager of a Durham brewery, gave evidence in favour of the Bill. He stated that about two and a half years ago they had discontinued taking water from a well, and had taken it from the Company, as what they wanted was hard water.

Mr. *Dodds*, Secretary to the Company, stated that the yellow specimens of water produced had been drawn by himself from a tap belonging to the Weardale and Shildon Company. He was a ratepayer, and attended the meeting to which reference had been made, and he it was who demanded a poll.

Mr. *Thomas Hawksley*, examined by Mr. MICHAEL.

I am a civil engineer of Westminster, and am engineer to more than a hundred water-works. I constructed the Durham Water-Works about 30 years ago, and have been connected with the district in other ways. Originally the working classes were miserably situated in regard to the water supply, as they had to get it either from the Market Place or from old-fashioned pumps. There was some difficulty in forming the Company, although water-works were cheaply made in those days. At present they cost just double what they did 30 years ago. The works of the Company have cost a great deal in consequence of the extensions that have taken place. They had only one engine at first, but have extended their works very materially. The city has not increased much in population, but the surrounding district has increased enormously, in consequence of the railways and the collieries. The railway depend solely upon the Company for their water supply. They take no less than 3 million gallons per month. The capital asked for in the Bill is required to carry out future extensions of the Company. Before the works were originally constructed, we had the water carefully analyzed by the celebrated Professor Johnson, who at that time lived in Durham, and who was not only acquainted with the character of the water, but knew the river and everything about it. He thoroughly approved of it as a source of supply. We were supported at the time by the authorities of the city—by the Dean and Chapter; they furnished us with the land. One reason for selecting the site where the works are placed was because the water was better in quality than we could get elsewhere, whether near or far off. Then we had no opposition; and the next reason was because near to that particular situation there was a very high hill, which was available for the purpose of constructing a reservoir, and by that means we were enabled to give a constant supply of very excellent water to the most elevated houses at satisfactory pressure. I may mention that Durham is a very particularly situated city. It is all up and down, like the seven hills of Rome; therefore, it is very difficult to supply it with water. The highest localities do not get a constant supply. We have had special pumping apparatus erected to enable us to serve these high places. Originally we could work without an Act of Parliament. The Public Health Act of 1875, however, contains a very ill-considered clause, and not only does not give protection to water companies not established by Act of Parliament, but, by not mentioning them, leaves them unprotected. We are, therefore, under the legal necessity to come to Parliament for an Act. The water supplied by the Company is chemically good, bright, palatable, and free from organic matter; it is a moderately soft water, and is excellent for dietetic purposes. I have never heard complaints of the quality of the water, and the objection which is taken to it is only the result of a peculiar agitation, which was, however, not got up until this Bill had passed the House of Commons. The Wear is full of great stones, which have been brought down from the hills, and I should describe it as a mountain stream. It is subject to such enormous floods that everything is swept away, and the stones look as clear as that glass on the table. With regard to hush water from the mines, it does no harm whatever. It is simply earthy matter, and, though it chokes the fish, it is insoluble. There is nothing deleterious about it, as it falls to the bottom in time. It is perfectly innocuous, and does not in the slightest degree injure the general character of the river. There is no poisonous refuse from the paper mills discharged into the Wear. I have compared this water with the water supplied to London. They are somewhat different in character, but I think the water of the Wear is infinitely preferable. It is not so hard as the London water, and therefore is not so injurious. The amount of impurity which comes into the river from villages and small places on the banks, or its tributaries, has been greatly exaggerated. Most of the houses in the district have not water-closets, but ashpits. Some of the places—Bishop Auckland for instance—are about to establish irrigation works, so that, in the course of a short time, no refuse will come from them into the river. It has been stated that when the river is flooded the water is far from being clear. That is true; but it is filtered, and made as clear as the specimen produced. The water from the Waskerley reservoir, which I myself constructed, is yellow and exceedingly soft. Owing to the softness it dissolves a large quantity of peat, and the whole mass of the water in the reservoir gets to look like what you can see in this bottle. It is unavoidable that all the water in the reservoir should become yellow. The Wear is diluted by clear streams, and is oxidized by dashing against the rocks. The vegetable colouring matter gets destroyed, burnt out, and the water becomes as clear as crystal. In regard to capital, we are only asking for the insignificant sum of £30,000, and if we obtain our Bill it will practically be to the advantage of the public. The public will be the great gainers by the Bill. The rates that are proposed to be charged are very moderate. They are levied upon the house-rent, and Durham is better situated than any other city I know of in that respect. The water is eminently suitable for general purposes. With respect to dividends, there is nothing asked for other than is usually given to water companies. Practically, the dividend amounts to little. There is no great advantage to the Company in having what the Corporation call the monopoly of the supply. If the Company do not do their duty they can easily be superseded, and the Local Authority have the remedy in their own hands. The River Wear is far too large to be injuriously affected by the lead from the mines. There are many bodies interested in the Wear, and all these people would be found to come forward if any injury was done to the river by the Company. We have given such a supply of water as has controlled every fire occurring in the city.

Cross-examined by Mr. VENABLES: There would be no difficulty in getting some one else to undertake the water supply if the Company do not do their duty, and, therefore, they have not a monopoly. If the water is not pure and wholesome, it is plain that the inhabitants have their remedy. The Company desire protection, as, if they do not have it, they may be disturbed and fined by the action of persons who may be influenced in their proceedings by insincere motives. It is within my knowledge that persons have objected to have their water supplied from a river where sewage entered.

FRIDAY, JULY 19.

Mr. *T. Hawksley* recalled, and further cross-examined by Mr. VENABLES.

The water supply is ample for the town of Durham, and well qualified for domestic use. Under the Bill the Company seek power to take water from nine or ten streams. The water is soft, and chemically good, and I have strongly recommended it for domestic purposes. I know the district, and the principal places where sewage is discharged into the Wear. There are a number of tributaries in such a large river, and consequently into some of them house slops are emptied. I know the Tudhoe Beck, but do not believe it is called by the name of the "Stinking Beck." The people, I dare say, think there is sewage in the water. That is a sentimental objection, as, in fact, there is no sewage in the water. Dr. Frank-

land has a theory that sewage is found in a river which comes from ante-diluvian remains. I have spent half a century in ascertaining facts, and upon these facts I found my evidence. I know the railway station, and should think there is sufficient pressure for the supply of water there. I have never found any defect in the supply.

Re-examined by Mr. LITTLER: There is a good supply of water except to a few isolated houses situated on the top of the hill. Dr. Frankland is satisfied with this supply.

Mr. LITTLER said there were a number of witnesses whom he could call to speak as to the supply and quality of the water.

The CHAIRMAN, after a brief consultation with the other members of the Committee, said that they were perfectly satisfied with the evidence on the subject.

This closed the promoters case, and witnesses were called on behalf of the petitioners.

Rev. *William Greenwell*, examined by Mr. BIDDER.

I am a Minor Canon of the Cathedral of Durham, and Rector of the Parish of St. Mary. I am also a Fellow of the Royal Society, and a Justice of the Peace for the County of Durham. I have lived in Durham 22 years, and am well acquainted with Durham and the Durham people. I am brought into daily contact with a great number of people in the whole town. I think that the feeling of Durham is exceedingly strong against this Bill. I believe that it is a general feeling, so far as I know; I have heard no feeling to the contrary expressed. I think this feeling exists upon more than one ground; but the principal ground is the nature of the water which is supplied. The people of Durham are not a scientific people; they are not aware of all the theories with regard to the purification of water; they only see the water which is supplied to them. They find it at times highly coloured, and that it contains a great quantity of muddy matter held in suspension, which is deposited after the water stands for a certain time, and is so thick at the bottom of the vessel that you might write your name on it. This I have myself observed over and over again. The water at times is offensive both to smell and to taste; that I know from my own experience, and from what other people have mentioned to me. The people of Durham object to the Bill upon another ground. We have seen in Durham a Gas Company. Some few years ago an attempt was made, in consequence of the charges of this Company, which, in the opinion of the inhabitants of Durham, are excessive, to establish another company. A Bill was applied for, but it was thrown out; so that at present the town is entirely in the hands of the Gas Company. This is one reason why the people of Durham object to having an Act for the Water Company, because they have already suffered from the Act which provides the Gas Company with the powers which they have. Again, I have heard people object to the Bill because the charges of the Water Company are in excess of the charges made in other towns, and they think that there is no reason why that should be so. I am aware that one of the clauses of the Bill proposes to perpetuate the present charges as maximum rates. I was present at a meeting which was held last month to consider a resolution in favour of opposing the Bill. It was the largest meeting I ever remember to have seen in Durham. I should think there were about 1500 persons present. I think the meeting fairly represented the most influential and largest ratepayers in the town, and that the meeting, as a whole, consisted of persons who were interested as ratepayers. When the motion was put to oppose the Bill I only saw one hand held up against it, whilst on the other side almost every hand seemed to be held up. That still continues to be the feeling in Durham upon the subject. Besides ratepayers, I know quite 300 owners of property who are opposed to the Bill. At one time it was supposed that a poll would have to take place, but it did not; and the claims of owners had to be sent in, in order that they might have an opportunity of voting. I know that claims were sent in on the part of 300 owners of property who were prepared to vote against the Bill. I do not drink the water. I drink other waters—Vichy or Apollinaris. I know that a very large number of people resort to wells within the city, and I daily see numbers of people going there habitually, as I have seen for years and years. I know the River Wear very well, from which the water is taken. As to whether there are any signs of sewage contamination I am not prepared to say, because I do not know what signs of sewage contamination are; but I know that the river is exceedingly dirty, that it is one day yellow, another black, and another a milky green, most offensive to the eye; and when the water is low it is equally so to the smell. To use plain language the river in summer very often stinks. I have frequently observed when the Company's water has stood for two or three days there has been a growth in the nature of something like moss, which has occupied a very considerable portion of the vessel. I have observed that over and over again. I know the river through a considerable portion of its course. I have fished all through it, and have found the river materially deteriorated within my experience. I think that the finest kinds of fish have decreased; though there are numbers of the coarser description of fish. The Fishery Association has broken up in consequence of the diminution of fish. Many of the tributaries which I knew years ago to be perfectly pure streams have become extremely polluted. I know the Browney; I was born upon its banks. It is by no means a pure stream. In the lower parts it has been for a considerable number of years very much polluted by the paper works. There are three paper mills, one of which is not now working. These have so polluted it that the fish are entirely destroyed. I could not answer that there might have been fish yesterday in the lower part of the river, coming up; but I know that below the paper mills, when they are in work, there are no fish at all. The Browney discharges itself into the river about three miles above the pumping-station. I may assert that the Browney has become much more polluted, since the time I have mentioned, by collieries upon it. Several collieries have been established upon the Browney since the time that I speak of, when the paper mills were the only source of pollution, and I see a difference certainly in the appearance of the water. I know the opposite tributary to the Browney—namely, the Tursdale Beck. At one time it was perfectly yellow in consequence of a colliery, but in the last few months, because that colliery has not been worked, it has become a perfectly pure stream. It is a matter of notoriety that the trade in that district is in a very depressed condition. In the hot weather in summer, in going along the river, I have observed very frequently that there is an odour perceptible. Last Sunday afternoon I inspected the river at the pumping-station, and shortly above it. The water was discoloured, I do not know what with; it was of a whitish-green colour, and at a depth of 2½ feet I could barely distinguish the bottom. I could see that there was a bottom, but I could not have told what the bottom consisted of, whether it was stones or sand; that was about half a mile above where the Company take their water. From what I know of the district, I should think that the probability is that the river will get very much worse. The present condition of trade is not likely to exist for ever, and upon a revival of trade there will no doubt be a great addition of population to the district, as fresh works will be undertaken. I have been told that the Weardale and Shildon Company, in addition to the water which they have already impounded, are contemplating, under their powers, impounding certain further streams. Those will be the purest of the affluents—I should say, almost the entire unpolluted streams of the Wear. I should certainly think the further abstraction of the unpolluted sources will greatly contribute to the degree of pollution in that which remains. Mr. Boyd, the Vice-Chairman of the Water Company, is my medical man. Some years ago I had a conversation with him about the condition of the water. I said I thought that the source from which the Company obtained their water was not altogether satisfactory, and I certainly understood Mr. Boyd to admit it, for he told me that a boring had then been sunk at Langley Park, where it was thought that there was a likelihood that a large and continuous supply of water would be found, and that if so they would use that water for the Company. He then admitted to me that the water was not entirely satisfactory; but he went on to explain that polluted water, after it flowed over a certain number of miles, and so on, became pure again.

Mr. BIDDER: Knowing what you do of the district, and of the river, and the circumstances which you have stated to the Committee, do you think that it is a wise thing, in the interests of the population of Durham, that they should be committed by this Bill to that as a permanent source of supply?

Witness: I think, looking at the facts, without reference to science, of which I do not pretend to know anything, that it is not only a disagreeable, but, I should say, an unhealthy source.

Mr. MICHAEL (in cross-examination): Would you adhere to that opinion if all persons most competent to judge told you that there was no source of danger in the water?

Witness: I should, certainly. I think that my own common sense would tell me so.

Common sense against science?—Yes.

Do you think that people would prefer the brown water which you have under you to the white water on the other side?—I know that several people who live in Durham, and have had occasion to drink that water from time to time, have told me that they very much prefer it to the Durham water. I think that the Durham water has a certain unpleasantness to the sight. If that could be got over, and if you found that the water was pleasant to the taste, it would be a different thing.

Cross-examination continued: We have had a great number of floods, until lately, which have washed everything out. I take it that the water is purer now than it will be later on in August, which is our dry month. In the early part of June the river was beyond its ordinary height, and its condition was such as I have mentioned. It was of an unpleasant colour—a whitish green—and you could see for no depth into it. I did not observe any smell. I have not noticed any smell this year, but I have done so for many years past. No doubt if steps were taken to prevent the sewage of Bishop Auckland coming into the river, its condition would be better. Mine is a small parish; there are only 14 houses in it.

Re-examined by Mr. BIDDER: My acquaintance with the people of Durham is certainly not limited to these 14 houses. I know people who use the Weardale and Shildon Company's water, and they are perfectly satisfied with it. I know people who live in Durham, and who have used the water outside Durham, and prefer it to the Durham water.

Mr. *William Proctor*, examined by Mr. BALFOUR-BROWNE.

I am a solicitor, practising in Durham, and have been for about ten years a member of the Town Council, who are the Urban Sanitary Authority of the City of Durham. I was born in Durham, on the banks of the river, so that from childhood I have had intimate knowledge of the district. I know the Wear and its tributaries well. I have fished in them all. Never in my recollection has it been a pure river. As a boy, fishing, I have found what we used to call the "hush," which, I suppose, had come from the lead mines—it left a sediment at the bottom of the river, and there was a kind of mud which covered everything, and I knew perfectly well that it was no use fishing until there had been a "fresh" in the river to wash it out—it made the fish sick. The first year that I called the attention of the Town Council to the state of the river was 1869. The first time I brought it forward it was more a general statement, raised for the purpose of provoking discussion upon the condition of the Wear. It has been an annual thing, and sometimes twice a year—sometimes I moved a resolution and sometimes I merely drew attention to the polluted condition of the river. In 1872 my attention was drawn to the most peculiar condition of the river at St. John's Chapel. I saw it in a semi-liquid state, but I afterwards ascertained that it was the hush coming from a lead mine which is situated a little way up in the hills. The water there was very dirty, and discoloured down to Walsingham, and how much further I do not know. I then described to the members of the Council the state and condition of the river, which I had observed, and moved a resolution on that occasion. Alderman Boyd made a defence of the Company, but my recollection of it is that he said he would not go so far as to assert that the water was perfectly pure. I remember a meeting of the Corporation on Jan. 8, 1875. A bottle of Durham water was then produced by Mr. Robson, and he stated that he had taken it from a tap of the Company. Some members said that it was dirt, but it was generally admitted that it more resembled pea soup than anything else. That was the remark which was made, and I believe that it was not contradicted. Even after that I could not get the Council to deal with the matter, for there are so many aldermen and councillors connected with the Water Company, the same as there are with the Gas Company, that we cannot get up any opposition. They, belonging to a majority in the Council, generally managed to get rid of these resolutions. On one occasion Alderman Boyd said that they were going for a further supply, and he mentioned Houghall Colliery, and also, I think, a ridge of hills at a place called Helmington. He stated that the Directors were negotiating with Mr. Love for a feeder which came to Houghall Colliery, near Durham, and that in a short time we should not have any reason to complain, as the Directors probably would be able to carry out their arrangements in a few months. On May 5, 1875, I moved a resolution to this effect—"That the condition of the River Wear, owing to it and its numerous tributaries being a receptacle for all sewage and other impurities from a large number of towns and populous villages, and also from numerous gas-works, paper-mills, and other manufactories, is such that the water is unfit for human consumption." A deputation from the Town Council to the Company has been appointed, I think, more than once, but I will not be certain.

Mr. MICHAEL: I must ask you to show me in the minutes of the Town Council any resolution appointing such a deputation. I am instructed that such a one was never passed.

Mr. BIDDER: I do not know that the witness said that a resolution was passed.

Witness: No; I said that I moved a resolution.

Examination continued: I know that a letter was read in the Council from Mr. Kale, proposing that Durham should combine with Gateshead to go for a purer supply of water, and that letter stated that the Wear was very much polluted. Mr. Kale is a very eminent contractor, and is well known throughout the North of England as a large railway contractor, and a contractor for public works; and I distinctly remember that that letter from Mr. Kale was accompanied by an official letter from Mr. Swinburne, the Town Clerk of Gateshead, offering to join the Corporation of Durham, and other districts, in forming a company to obtain a purer supply of water for Gateshead, Durham, and other places in the North of England.

Mr. Kale, besides being a great contractor, has a very intimate knowledge with regard to the river. This communication was made by the Corporation of Gateshead, or by their Town Clerk, I think some time during 1874. I can remember when the River Wear, with the exception of the lead hush, was certainly very considerably freer from sewage and colliery pollution than it has been within the last 12 or 15 years. Where there was not more than one farm once, as I remember, there is now probably a population of 30,000 or upwards. If you take the whole line of country on the banks of the Wear, there is probably a great deal more than 30,000. It was a calculation made by a local rural authority, for a portion of the district, that the population was 26,000. Between Croxdale, where the Brownie enters the river, and Byers Green, there is an immense population. All the way from Croxdale it is nearly all built upon; there are great centres of population; there are villages, but the place is literally built upon along the road, and it is close to the River Wear. If you embrace Spennymoor, I should speak considerably within the mark when I said the population was 30,000. Spennymoor carries its sewage into the river. There is a burn there called Tudhoe Grange, and a great deal of sewage goes down it. The Browney is one of the most important tributaries of the Wear. I remember when it was a comparatively pure stream. The River Dearness was at one time pure—I do not remember there being a purer stream, or one less polluted, in the whole county of Durham, if not in the adjoining county. There was no population, excepting at a farmhouse, which was a mile off. The valley of the Dearness now contains a great number of dense populations, the houses being built close on to the edge of the stream, and it is little better than a receptacle for sewage. The Dearness has long ceased to be a fishing river; no fish will live in it; it is made a sewer for several collieries. The Fishery Association has been broken up, and it is of no use for an angler to attempt either the Dearness or the Wear now. If you want to fish you must go away from this part of the county of Durham. Trout, dace, roach, and tench, I believe, were introduced, but they were not fish native to the river. There is now an occasional trout, but it is not worth the trouble for an angler to attempt to fish there. I do not say that the Browney is quite so bad as the Dearness.

Cross-examined by Mr. MICHAEL: I do not say that there are no fish, but there is such a diminution, that it is not worth an angler taking the trouble. I have seen one fish occasionally. In common with the general people of Durham, I have long held the opinion that the River Wear is an improper source of water supply. I have brought the matter forward on many occasions in the Town Council, and other members have done so as well. Mr. Robson has done so on two occasions. The Water Company are strongly represented in the Town Council. Alderman Boyd, having been Mayor, is a man of considerable influence there, and then there is Alderman Watson, the solicitor for the promoters of this Bill, besides several gentlemen who were Councillors, and retired when this question came on for discussion.

Mr. MICHAEL: On any of the occasions when you brought forward these motions, was any resolution carried in accordance with your views? I do not speak of the present agitation. You say you brought on these resolutions once or twice every year before the Town Council; did the Town Council ever pass a resolution confirmatory of your views?

Witness: They did not pass the resolution, although I moved it twice. I withdrew it because Alderman Boyd stated that negotiations were going on for the purpose of obtaining a supply from other sources, and that we should have no reason, in a short time, to complain of the supply having been obtained from the River Wear. That is six years ago.

When you found that no means were being taken in order to get a supply from other sources, did you bring the resolution forward again?—I have brought it forward annually, and so have other members; but it was never put to the vote; we always found ourselves in the minority.

Re-examined by Mr. VENABLES: I believe that I moved this resolution twice, and on every occasion that I made a statement of complaint, we always had a promise from Alderman Boyd that something was going to be done. He promised on one occasion that filter-beds were going to be put in, and that the pipes were going to be cleaned out; therefore, I withdrew my resolution. It was also held out that the Company would take steps to get water from some other source.

Mr. *Thomas Robinson Richardson*, examined by Mr. BIDDER, said he was a printer, carrying on business in Durham, and was a member of the Tow n Council. He had resided in Durham all his life, and well knew the River Wear and its tributaries. He had observed a great many changes in the river. On the River Browney there was a great number of collieries, but he could not tell the exact number. It was formerly a river well known for fish, and now he found very few there. He had observed pollution going into the stream from the collieries and paper mills. He had seen a white scum on the top of the Browney. The River Dearness was not a pure stream. Brandon, which was near, was a colliery place, and the sewage from there got into the river; in fact, it could not do otherwise. Sometimes the water was as thick as treacle. The sewage was swept down when the floods came. As to the Wear from Sunderland Bridge, it was formerly cleaner than it was now. Its present condition varied. One day it was the colour of gin, and another it was quite black. It also had a very offensive smell at Croxdale Colliery. There was pollution of the water there by sewage which ought to go into the tanks, but they had not been cleaned out for some time. The pollution they could smell 20 yards off, at Tudhoe Grange and Spennymoor. The beck there was called the "Stinking Beck" on account of its smell. On a very dry day when he was there he saw great pollutions of the water. To his knowledge, much dissatisfaction had been expressed as to the condition of the water, and he had not drunk any of it since 1875, and was determined not to do so, as he had set his face against it. In the summer of 1873 great dissatisfaction was expressed as to the state of the water, and bottles of the water were brought to him as samples. In one of these he found a large quantity of worms. He showed one of the samples to Alderman Boyd, who said that he did not believe that it was got from their water. He had always been anxious to bring the question before the Town Council, but it was he who, with reference to the resolutions to oppose the Water Company's Bill this year, moved that they should not be confirmed. The meeting was held after it had been found out that the Council were too late to oppose the Bill in the House of Commons—that the time had gone by. The Town Clerk and the Mayor had expressed a view that they had no *locus standi*. He then moved the following resolution:—"That the minutes of the last meeting be confirmed, with the exception of that part which has reference to the Water Bill, the confirmation of which minutes would make the Municipality absurd, as nothing has been done." It was his intention to throw upon the Mayor and Town Clerk the onus to remove the slur that was cast upon the character of the Council.

Cross-examined by Mr. MICHAEL: He had never made any complaint against the Company till 1872; the complaints that he made prior to that being far from against them. It was not his intention to do the Company any harm if they would reform themselves. He had complained in the Council about the water supply, but could not say that there had been any resolutions passed.

Re-examined by Mr. VENABLES: He was speaking of what he had seen and taken notice of over a series of 34 years. He had actually seen sewage matter in the becks.

Mr. *Thomas White*, examined by Mr. VENABLES, said he was an Alderman of Durham, and had served the office of Mayor. He had been in the Town Council since 1860. The Town Council in December passed a resolution to oppose the Bill, and it was entrusted to the Mayor and a Committee to carry out the resolution.

Mr. MICHAEL said he must again ask for that resolution, because he was informed no such resolution was passed until February.

Witness said he was quite sure there was a Committee appointed to watch the Water Bill. Eventually it was found that the time was gone by for petitioning in the House of Commons against the Bill. The Committee were appointed, and, in his opinion, ought to have been called together immediately, which was not done. He himself asked the Mayor to call the Committee together, but he said it was quite time enough when he had a copy of the Bill. Alderman Stevenson, in witness's presence, asked the Mayor to call a meeting, and he again repeated that it would be quite soon enough when he had a copy of the Bill. Witness said, "You will see if you do not call a meeting that it will be too late, and there will be a row about it." The Committee eventually were called, and unanimously passed a resolution recommending the Council to oppose the Bill.

Mr. LITTLER said that if the resolution was passed it must be recorded. The Town Clerk, however, had said there was no such resolution, so it was quite clear it was not a formal one.

The CHAIRMAN asked if there was a report of the Committee.

Witness said he thought there was, but would not be quite sure. He would not say whether there was a written report or not. He thought it was verbal.

Mr. LITTLER said he was told there was never any report or resolution whatever brought before the Council.

Mr. VENABLES said, on the 6th of February, he found "Resolved, on the motion of Alderman Thomas White, seconded by Councillor Samuel Holdsworth, that the Board take the necessary steps to oppose the Durham Water Company's Bill, now before Parliament."

Examination continued: At that time there were 15 members present, and to make a resolution binding, there must be an absolute majority of the Council. There were 13 who voted for the resolution, and 2 recommended some sort of a compromise, that the Committee should wait upon the Directors of the Water Company. That resolution being passed, it was, in his opinion, the duty of the Mayor and Town Clerk to carry it out. He thought, however, everything was done to curtail the powers of the Corporation. He explained that this matter was rather a peculiar one. The Town Council could not absolutely pass a resolution binding the ratepayers upon these matters. The resolution which was passed in February ought to have been confirmed in March, but in consequence of not getting a copy of the Bill, it was not, and the Water Company had the Bill read a second time in the House of Commons. Many of the members were very much offended about it; and Mr. Richardson, in witness's opinion, very unwisely proposed to rescind that part of the resolution to oppose the Bill, instead of confirming it. That was as a sort of censure upon the Mayor. Witness was one of those who were very much dissatisfied with the intention of the Corporation not being carried out. Some time afterwards, on the 30th of May, when it was time to petition the House of Lords, the Corporation held a meeting, when a resolution was passed to oppose the Bill. 15 members voted for, and none against it. The minutes showed "that the Town Clerk be instructed to prepare and lodge a petition in opposition to the Durham Water Company's Bill, and to retain parliamentary agents." There was a public meeting of the ratepayers to confirm this resolution, and another meeting, with an absolute majority of the Council, to confirm that. There was an absolute majority of 15. At the public meeting the voting was quite unanimous. He was not of opinion that the present source of supply was satisfactory.

Cross-examined by Mr. LITTLER: He had drunk their water ever since the Water Company were established, and it had not killed him nor any of his family. He had been in the Corporation since 1860, but he did not remember ever having brought the question of insufficient water supply before the Council. He thought it had been mentioned, but whether a resolution was put or not he did not know. He did not know when the Bill was read a second time in the House of Lords.

Mr. LITTLER asked if he did not know that the Corporation did not petition at all, and that it was only by reason of Lord Redesdale postponing the Bill that they ever had their petition presented.

Witness said it was because there was not time and they had not received the sanction of the ratepayers; but the public feeling was so strong in Durham, after not passing the second resolution, that after some little delay the Corporation were bound to take it up. All he could say was that it was a great blunder. He thought he advised Mr. Richardson not to press his motion to rescind the resolution, but did not divide the Council on the matter. He denied that the Corporation had lost any time though admitting that they signed a petition (not praying to be heard) on the very last day that it could be presented; that would be on the second day after rescinding the resolution.

Re-examined by Mr. VENABLES: So strong was the feeling in the town that the Corporation were obliged to act, and there is no doubt that it was in some degree from the pressure put upon the Corporation by the inhabitants that the Bill was ultimately opposed.

Mr. *Thomas Bell*, examined by Mr. BALFOUR-BROWNE, said he was one of Her Majesty's Inspectors of Mines for South Durham, Westmoreland, and the North Riding of the county of York. He had been a mining engineer 30 years altogether, including 5½ years an inspector. His duties took him into the watershed of the Wear above Durham. He had known it for nearly 40 years. In 1846 there were 54 collieries working within the watershed above the Company's intake. There were now 161. The 54 that were in existence in 1846 had been considerably enlarged since that date. Altogether there was an increase in the number of pits of about 107. There were 9 pits situated upon the Tursdale Beck, and a population associated with them of 11,360; on the Browney 22, with a population of 9770; on the Dearness 26, with a population of 18,114; on the Gaunless, that flowed in at Bishop Auckland, 42, with a population of 19,049; on the Beech Burn 21, with a population of 7202; and on the Wear itself 41, with a population of 24,478; making a total of 161 collieries, and a population of 89,973. At the present time there was great depression in the coal trade, and 61 of them were not now working. In all there were 12 lead mines within the area of the watershed. In the summer time the River Wear was very low, and generally clearer than at any other season of the year. The pit water was not fit for domestic purposes, and there were various refuses from the water. He had noticed the deterioration of the water since 1846, and it was not now so bright. Since that time several impounding reservoirs had been constructed on some of the tributaries higher up the stream. The Waskerley Water Company had impounded a considerable quantity of water that formerly flowed down the river. He knew that besides those reservoirs the Company had power to impound other streams, and make other large reservoirs, so that the amount of pure water would, in course of time, be even more greatly

diminished than in the past. The reservoirs they had a right to make would impound the best water to be found in the watershed, the water flowing from the millstone grit. About a quarter of a mile from the Company's intake there was a colliery with over 150 houses built round it, discharging their sewage into the river about 22 yards below where the Company pumped their water. At that point there was a bend in the river, and as the water ran down, it struck against the side, and formed an eddy, and he had no doubt that a considerable quantity of the sewage was carried back those 22 yards to the suction-pipe, and actually taken into the Company's works. Knowing this district well, he thought there were many places where, if the Company chose, they could get better water than they were now getting. They could have water from the magnesian limestone or lower new red sandstone at several places, commencing at Ferryhill, and, following the range of limestone, they could go down as far as Sherburn, or below that. Water had actually been found in that state at Ferryhill. As much as 5000 gallons per minute had been obtained by sinking a pit, and there was a large quantity at Shadforth, about four miles east. He had been up the Gaunless three or four times within the last five or six weeks, and found it in a very filthy condition. The Gaunless threw all its filth into the River Wear. It entered just below the park.

Cross-examined by Mr. LITTLER: The water, in his opinion, was not fit for domestic purposes. As a mining engineer he would have some respect for science; but if analysis proved that the water was pure, he would not trust to the analysis. As to the water from the Houghall Colliery, he did not know that there had been an analysis made, and that it was singularly pure, but he knew that when he had to do with it it was anything but so. There was a system of drainage for the collieries underground by cuts or water-levels. He could not say positively that there was a single water-closet or a single drain running into the river at Houghall; he did not remember to have seen any.

Dr. *E. P. Jepson*, examined by Mr. VENABLES, said that he thought the water was very bad and unwholesome. It was often discoloured, and a considerable sediment fell, which he attributed to sewage pollution, as he knew perfectly well that a great deal of sewage went into the river. He did not know of a single water-closet; consequently, the whole of the excrementitious matter went into the tributaries, and thence into the river. He knew all of the populous villages in the district, and, as a rule, found them in a low state of health. Among other diseases, they were often plagued with typhoid fever, and where matter from typhoid patients went into water it was peculiarly dangerous to those who afterwards used it. It was his firm belief that in the event of there being cholera in some one or other of these villages, it would involve the danger of infection, by means of the water, to those who used it. It was not possible to detect by chemical analysis, or by any other method, the difference between water infected with germs of typhoid and water which had merely had ordinary sewage discharged into it. Consequently, it might be that, although analysis showed nothing that would indicate typhoid, still typhoid contamination might be there. He happened to know that diarrhœa was a very frequent occurrence in certain establishments in the place. That was generally supposed to be caused by the use of bad water. He had signed a declaration with reference to the water, and nearly all the medical men in Durham had done the same. He quite endorsed the opinions it expressed.

Cross-examined by Mr. LITTLER: He had never written to the Corporation to say that, in his judgment, the river was a dangerous source of supply, and that if fever broke out up above, Durham would be imperilled. He first publicly expressed this opinion many years ago. The death-rate of a town might be considered a test of the water supply. He thought the death-rate of Durham was very moderate. He had never in his life made an analysis of the water, it was out of his line altogether.

Re-examined by Mr. VENABLES: He had had a death from typhoid fever in his family, and attributed it to bad water. He believed it to be true that the water had produced typhoid, and it was very natural that it should do so.

Mr. *R. N. Robson*, examined by Mr. BIDDER, said he was a surgeon, and had practised in Durham for about 37 years. He had found the water very often muddy and unwholesome, and occasionally putrid; it had not remained in his bottle over 24 hours before it was smelling. In his judgment it was certainly not a wholesome water to permanently supply to a large population like that of Durham. His observation confirmed the evidence of previous witnesses as to the quantities of sewage that ran into the river at different points. From what he knew of the upper part of the river, it was certainly not consistent with the water being a wholesome water as supplied to Durham. He understood that the present Bill proposed to give the sanction of Parliament to it as a permanent supply for the town of Durham, and he did not think, in the interest of Durham, that it was expedient or right to give such a monopoly. He generally sent to the wells in the neighbourhood for the water that he and his family drank. He had found that many people complained of the quality of the water. He entirely agreed with the evidence of the last witness as regarded the liability to danger in case of typhoid epidemics. He was medical officer to the Union, and in his district, and among his own private patients, he had had many complaints of the water.

Cross-examined by Mr. MICHAEL: There had been epidemics in the city during the last seven years, but not of typhoid fever. Bowel complaints were very often referable to the drinking of water with sewage in it. As far as the records of mortality went, they certainly showed a singular absence of mortality from these causes.

Re-examined by Mr. BIDDER: There was one particular thing that had struck him that he would like to mention concerning the water—that sometimes it deposited a sediment within 24 hours; and in hot weather that sediment became perfectly noxious. With the Company's water, for years and years, they had tried to pickle beef, and could not succeed—it always went wrong. They tried everything to put it right, but in no case could they succeed until well water of the district was used. With the Company's water it turned putrid.

Mr. *Pratt*, examined by Mr. BIDDER, said he was a surgeon practising in Durham, and his judgment coincided with that of other medical men in Durham on the subject of the water supply. At the present time the water was in a much better condition than he had known it before, and he considered that that was due to the heavy rainy seasons previous to June, by which the river was completely washed out; and there not being the same amount of impurity coming down, of course the water was much better than usual. He would not consider it a wholesome source of supply for a permanency, when there was so much impurity coming into the river, even in spite of Dr. Tidy's analysis. He had within the last fortnight attended a family suffering from scarlatina, and found that the child's recovery was protracted, although the case was a very slight one. The mother complained of its being troubled a good deal with vomiting, and on inquiry he found that the whole family were troubled with it whenever they drank any water. On examining the water—he never analyzed it—the stench was quite sufficient to show that the water was not fit for drinking. It was offensive in odour and also in taste. He thereupon directed that they should get their drinking water from some other source. They did, and at once the symptoms ceased.

Cross-examined by Mr. LITTLER: He had never had the water analyzed. He was a resident in Durham at that time, and was drinking the Company's water. He did not vomit, but should have done so if he had drunk the water supplied by the Company's tap.

(To be continued.)

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, JULY 27.

(Before Vice-Chancellor MALINS.)

In re THE HERNE BAY WATER-WORKS COMPANY.

This was a petition presented by Messrs. Ripley and Haigh, preference debenture-holders, for the purpose of obtaining a compulsory winding-up order.

Mr. GLASSE, Q.C., who appeared for the petitioners, said he had already obtained a decree at the Rolls for payment of the debts, and for the appointment of a receiver, and he now wished for the winding-up order, so that the Company might obtain another Act of Parliament. They were unregistered, and were appointed under an Act for the purpose of supplying Herne Bay and adjacent places with water. The second section of the Act provided that the capital should be £5000, in 500 shares of £10 each, and by the 11th clause it was enacted that the Company might, from time to time, borrow on mortgage any sum not exceeding, in the whole, £1200. The whole of that amount had been lent by his clients. The 12th section enacted that the mortgagees of the Company might enforce payment of arrears of principal and interest due upon their mortgages by the appointment of a receiver, and in order to authorize the appointment of a receiver, the amount owing to the mortgagees was not to be less than £500.

The VICE-CHANCELLOR asked on what ground the order was opposed. It seemed to him that the Company were insolvent. He should like to know whether they were doing any good.

Mr. HIGGINS, Q.C. (who opposed on behalf of the Company), said that depended upon what his Lordship meant by "good."

The VICE-CHANCELLOR: Are they making money?

Mr. HIGGINS said the concern had not been successful.

The VICE-CHANCELLOR wished to know why the order was opposed.

Mr. GLASSE said he had read the affidavits, and was quite unable to answer the question.

Mr. HIGGINS said, if the petition was dismissed, and a new manager appointed, there would be enough to pay the petitioners.

Mr. GLASSE said a receiver was already in possession, and the Company were indebted to him in the balance of the accounts.

The VICE-CHANCELLOR asked how much was owing.

Mr. GLASSE replied £1200. A receiver had been appointed, but he did not get in enough to pay the expenses.

The VICE-CHANCELLOR: What is the use of contesting this petition?

Mr. GLASSE said he could not conceive.

Mr. HIGGINS said the petition would be opposed, and he thought effectually opposed. The point was a very short one. The Company were formed under an Act of Parliament for executing public works.

The VICE-CHANCELLOR asked whether they were within the Winding-up Act.

Mr. HIGGINS replied possibly they might be.

Mr. GLASSE: Surely they are.

Mr. HIGGINS preferred to use the word "possibly." The Court would not make an order, upon the following grounds:—First, that the property of the Company could not be disposed of without going to Parliament. Secondly, that the petitioners, being debenture-holders, had stipulated for a special remedy in case of non-payment—namely, the appointment of a receiver, and as a receiver had been appointed they could not possibly have any further relief. They could only have the fruit of the tree, not the tree itself. His third point was that he appeared for debenture-holders who were not hampered by considerations such as he had mentioned, and they opposed the petition.

The VICE-CHANCELLOR said he had not, up to the present, heard anything to justify such an opposition. To keep on such a concern appeared to him to be nonsense.

Mr. HIGGINS said winding up would be nonsense.

Mr. GLASSE said he wished to get an Act of Parliament, and he could not do so without a winding-up order.

Mr. HIGGINS said that was not so. The Company could go on, and meant to go on.

Mr. GLASSE said that up to the present they had not gone on, and he did not believe they could go on.

Mr. HIGGINS replied that they did not wish to have the Company broken up by people who had contracted not to do so.

At this stage the Court rose, the further hearing being adjourned.

WEDNESDAY, JULY 31.

Mr. GLASSE, resuming his argument, said the petitioners debt became due on Sept. 18, 1874. The Company were afterwards empowered to create further capital to the extent of £3000, but it was provided that the money so raised should not have priority over the petitioners mortgage.

The VICE-CHANCELLOR: You seem to be first incumbrance?

Mr. GLASSE: Yes, for £1200. On May 7, 1872, the petitioners filed their bill for a receiver, who was appointed, and the receiver had nothing wherewith to pay. The petitioners proposed to sell, but found they could not do so until they obtained a winding-up order. That was exactly what was done with the Exmouth Dock Company, following two or three other cases. There were persons willing to purchase, but a title could not be made without a winding-up order, and an Act of Parliament could not be obtained for the same reason. Without the Act, there could be no sale.

The VICE-CHANCELLOR: What is the ground of opposition?

Mr. HIGGINS: I will tell your lordship—

Mr. GLASSE, continuing, referred to the cases of the Bradford Canal Company and the Wey and Arun Canal Company.

The VICE-CHANCELLOR: You say, Give me a winding-up order, and I can get an Act of Parliament?

Mr. GLASSE: Yes; and then I can sell to purchasers who are ready to pay £2000 in addition to my debt.

Mr. HIGGINS asked his lordship to dismiss the petition with costs, or, at all events, that it should stand over until November. If the petitioners did not want to get hold of the property to favour certain purchasers, no harm would be done by the delay, and they have an extremely good chance of being paid. The petitioners rights were defined by their Act. They were entitled to have a receiver appointed, but not to break up the concern. The Company were supplying good water to the inhabitants of Herne Bay, and although not now flourishing, would soon be, for the property was increasing in value every day.

Mr. GLASSE said the evidence of the receiver was that he had not passed his accounts since the 16th of June, 1875, because the current expenses were so large as to absorb the income, and there were no funds out of which the expenses of passing the accounts could be paid.

Mr. HIGGINS replied that that was contradicted and disproved.

The VICE-CHANCELLOR said it appeared to him there were two reasons why the petition should stand over. First, because in the meantime the petitioners might be paid; and next, it being admitted that nothing could be done without the aid of Parliament, if a winding-up order were made in November there would be plenty of time.

SATURDAY, JULY 27.

(*Before the* MASTER OF THE ROLLS.)

In re THE PURE CARBON GAS COMPANY, LIMITED.

This was a petition to wind up the above Company, by a small creditor who alleged that he could not get paid.

Mr. SOLOMON appeared in support of the petition, and said that another petition had been presented to Vice-Chancellor Malins, which was in the paper on the preceding day, but, owing to pressure of business, had not been reached.

Mr. JENKEN, for the Company, asked that the petition might stand over, in order to see the result of a meeting of Shareholders, which was to be held next Monday, to sanction a contract for the sale of the assets of the Company for £500, and a royalty which would amount to £250 extra in five years. The total debts, including moneys due to the Secretary and Engineer, were stated to be £600; so that if the contract were carried out the creditors would be paid in full.

The MASTER of the ROLLS, after some discussion as to which petition had precedence, made the order to wind up on Mr. Solomon's petition, but delayed the drawing up of the order for 14 days, to enable the Company, if possible, to make an arrangement.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

WATER SUPPLY IN BERMONDSEY.

DEPUTATION TO THE LOCAL GOVERNMENT BOARD.

On Tuesday, the 30th ult., a deputation from the Vestry of Bermondsey waited upon the President of the Local Government Board (Mr. Sclater-Booth) to make representations respecting the defective supply of water in their district.

Mr. HARRISON (Law Clerk to the Vestry) presented a memorial, in which it was alleged that the Southwark and Vauxhall Water Company, by whom the larger part of the district was supplied, had failed to give such a supply as was adequate to the needs of the inhabitants. It was known that many houses had been without water for several days in succession, and numerous complaints had been made to the Vestry on the subject. Besides this, it was alleged that the quality of the water was defective. The Company had, at a very large expense, constructed a reservoir at Nunhead, capable of holding 18 millions of gallons, specially for the supply of the district, but this reservoir had never been brought into use. The object of the present deputation was, he said, to urge upon the Board that pressure should be put upon the Company to compel them to provide a constant supply, or to adopt other means, whereby a sufficient and wholesome supply might be furnished. He submitted a list of cases in which it was known that deficiencies in the supply had occurred.

The PRESIDENT: In respect of how many of these have you laid the complaints before the Company?

Mr. HARRISON: In every instance a letter is sent to the Company giving the nature of the complaint.

The PRESIDENT: Have you sufficiently investigated the complaints to say whether the fault lies with the Company or with the owners of the houses?

Mr. HARRISON could not say of his own knowledge, but the Medical Officer of Health and the Surveyor were present, and they would doubtless speak to the points.

The PRESIDENT: In this department we know that the Company themselves have numerous complaints—a very much larger number than you speak to—but is there any one here who has examined the circumstances of any case so far as to say whether the mischief complained of arises through the fault of the Company, or in consequence of the imperfect construction of the fittings of the houses?

Mr. WILLETT said he could speak to that point. In his own house he had been without water for four days at a time, which was, of course, a source of infinite annoyance to him and his family. Whenever, in consequence of any complaint he had made to the Company, the water had been turned on, he obtained a good supply, thus conclusively showing that the occasional deficiency was the fault of the Company in not keeping up the supply. He had noticed that on Sundays the poor people of the district had been obliged to take pails of water from the Thames for cooking and washing purposes.

Mr. PORTER said he could substantiate what had been stated by the last speaker, the deficiency of water having been particularly felt during the late warm weather. The parish of Bermondsey had during the last ten years, according to the census returns, increased by 30,000 inhabitants, yet the Company had not put down a larger main to meet that increase of population. He believed the pipes were not of a sufficient capacity to supply the enormously increased demand made upon them. Some two or three years ago, in answer to their complaints, the vestry were informed that a large reservoir had been erected at Nunhead, which when charged would be the means of supplying that section of the Company's district by gravitation. This reservoir, he understood, had been finished for some time, but the reasons why it had not been charged were, he believed, that unless some means were resorted to, by providing larger mains to supply the eastern section of the Company's district, the new supply could not be taken advantage of.

The PRESIDENT: Do you join in the application that some steps should be taken to secure a constant supply?

Mr. PORTER: Most certainly; and I think that the owners in general would subscribe to it. I look, however, upon the constant supply as a last resource. We should be content with an intermittent supply, if we could get it efficient.

The PRESIDENT: If you rely on the constant supply as a remedy, the Act of Parliament gives you instructions how to attain it; but if you only complain generally that the Company do not do their duty, and do not meet your requirements, I shall be happy to inquire into the special allegations.

Mr. PORTER: An inquiry is what we wish for.

The PRESIDENT: Of course you are aware that, under the statute, there is a proper and recognized method by which you can make application for a constant supply, and you must make that application in the proper form, in order to put me in a position to enforce its provisions.

Mr. SHEPHERD: Is it essential that the Vestry should put the Act referred to in operation, in order to secure to the inhabitants a proper supply of that for which they are charged?

The PRESIDENT: It is necessary in order to get a constant supply.

Mr. SHEPHERD: We look upon the constant supply as a last resource, as the intermittent supply would answer all purposes if we could get a sufficient quantity.

The PRESIDENT: If you complain that the Company are not doing their duty, I shall be glad to inquire into it; but if you rely on the remedy of constant supply, you have the power in your own hands. Can you ensure proper fittings for the distribution of the water? I have been informed that there are 60 or 70 complaints against this Company, the greater part of which are attributable to the fittings of the houses, with which the Company have nothing to do. If the Company fail to deliver all the water they ought to supply, it is a great dereliction of duty for which they are responsible. I find that in some of the houses in the wealthiest parts of London there is the grossest neglect on the part of the landlords. I could mention a case in this neighbourhood in which the owners are to blame for the inconvenience caused from this source. If I find in your case that the Company are to blame, I shall be happy to bring it under their notice; but, if the deputation say they want a constant supply, I must refer them to the requisite proceedings under the Act, by means of which they can get it. So far as your general complaint is concerned, I will look into it. If you desire the constant supply you must make formal application under the Metropolis Water Act of 1852, accompanied by a proper memorial, then a formal inquiry can be made into the circumstances of the case. That evidently is the course which you should pursue.

Dr. DIXON, Medical Officer of Health, said their complaint was that the water was not only insufficient in quantity, but also bad in quality, so much so that if the inhabitants did not clean out their cisterns every week the water was unfit for use. The Bermondsey Baths were sometimes in such a disgusting condition through this cause that persons had refused to make use of them. No doubt the cause of complaint was sometimes to be found in defective fittings, but in other and equally frequent cases, such was not the cause. He had also known of cases in which the fittings of one house had caused a deficient supply in other houses, and in half a dozen houses the water of one might be running to waste, and an insufficient supply be received by the rest. People were not expected to pry into their neighbours houses to find out such causes, and he did not know but that it was the duty of the Company to see that the consumers were supplied with proper fittings.

The PRESIDENT said the last speaker had exaggerated the liability of the Company.

Dr. DIXON said the Company were bound to supply sufficient water, and that of good quality.

The PRESIDENT, in dismissing the deputation, repeated his recommendation that a formal complaint, signed by at least 20 ratepayers, should be presented to the Local Government Board, when an official inquiry would be instituted.

The deputation then withdrew.

The following are the returns of the Society of Medical Officers of Health, on the Composition and Quality of the Metropolitan Waters in July:—

NAMES OF WATER COMPANIES.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen. — As Nitrates, &c.	Ammonia. — Saline.	Ammonia. — Organic.	Hardness (Clark's Scale). — Before Boiling.	Hardness (Clark's Scale). — After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	19·20	0·068	0·125	0·001	0·010	13·7	3·0
West Middlesex	18·50	0·067	0·090	0·001	0·010	14·3	3·0
Southwark and Vauxhall	17·60	0·067	0·090	0·001	0·011	13·7	3·0
Chelsea	18·30	0·057	0·075	0·001	0·009	13·2	3·3
Lambeth	18·70	0·068	0·105	0·001	0·009	13·2	3·3
Other Companies.							
Kent	29·80	0·010	0·390	0·000	0·002	20·6	6·5
New River	18·30	0·046	0·135	0·000	0·008	13·2	3·3
East London	19·90	0·046	0·090	0·000	0·008	13·7	3·0

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, Grand Junction and West Middlesex.

C. MEYMOTT TIDY, M.B.

YORK UNITED GASLIGHT COMPANY.

The Sixty-Eighth Half-Yearly Meeting of this Company was held last Thursday—Alderman WEATHERLEY, the Chairman of the Board of Directors, presiding.

The SECRETARY (Mr. C. Sellers) read the following report:—

The Shareholders will remember that a year ago the price of gas was reduced from 3s. to 2s. 6d. per 1000 cubic feet, and, taking this reduction into account, your Directors consider that the financial condition of the Company is satisfactory. It is true the profits upon the year fall short of the dividends by £634 18s. 4d., and have not been sufficient to allow the usual amounts to be carried to the depreciation and contingent fund, but these results were mainly anticipated.

Your Directors recommend that the usual dividend of 5s. per share be declared, the same to be paid on and after the 6th inst., free from income-tax. During the half year some important extensions of the Company's mains have been carried out, and to meet the growing suburbs of the city more will soon be required.

Your Directors have to congratulate the Shareholders upon the success attending the Company's recent application to Parliament, and, in accordance with the terms of the new Act, they have had under their consideration the expenses already incurred in procuring the same, the extension of mains, the purchase of the site for new works, and also the provision necessary to be made for the future requirements of the Company.

They recommend that powers be taken from the special meeting of the Shareholders to raise and create 8000 new shares of the value of £10 each, to be apportioned at the rate of two new shares to every five shares of the Company's present stock.

The CHAIRMAN, in moving the adoption of the report, said he thought the Shareholders would all agree with him that it needed no argument from him to commend it to their approval. During the past six months a great deal of work had been done; in fact, they had been so fully occupied that they had had no time for idleness. He would not attempt to go into certain matters in connection with their recent application to Parliament, but he would simply observe that they had put their shoulders to the wheel to win. They did win, and they now desired to congratulate the Shareholders upon their success, and to offer a friendly hand to every one who on that occasion opposed them. He could assure them that his colleagues and himself had no other feelings, and, as in the past, they endeavoured to make the Company very successful and popular—and he believed they had succeeded; so in the future they should continue to follow the same policy, and he had no doubt they would obtain the same results. The ordinary business of the Company during the past half year had made fair progress. Several new streets had been formed in the suburbs of the city, and great activity in building was still going on, which, as the report stated, necessitated some important extensions of the Company's mains. All that, of course, told upon the expenses of the Company, but the future was full of promise, and he had no doubt that they would be repaid. The half year's profits, considering that a year ago the

price of gas was reduced to 2s. 6d. per 1000 feet, he thought might be called satisfactory. They had made in the past half year—which he ought to tell them was always the best half year for profit—about £3000 more than the dividend; but, in the December half year, with the reduction of the price of gas fresh upon them, they were short of the necessary amount; but still, putting the two half years together, they were only £634 short, which was not a serious amount, and which he trusted they would be able to bear. They had lately made one or two contracts, which would to some extent assist them, and the rest, he hoped, would be made up by the return of better trade. However, all that was uncertain, and the less he dipped into the future the better. With the view, however, of being prepared for the future, and in order to carry out those new works which the Shareholders had already sanctioned, the Directors would have to ask them to provide additional capital.

Mr. J. F. TAYLOR seconded the resolution.

Mr. RYMER said he would like to reciprocate those congratulations which were mentioned in the last clause of the report of the Directors. He thought they, as Shareholders, should also congratulate the Directors upon the successful way in which they had carried through their undertaking, in connection with which they must have had an endless amount of work. It would be remembered that at their last meeting, and also out of doors, certain Shareholders were afraid that, by promoting the Bill in Parliament, they would be damaging, instead of benefiting the Company. If those gentlemen would now look around and observe the price to which stock had risen, and note the anticipation with which the allotment of new 5 per cent. shares was awaited, and also take into consideration the rate at which York was extending, he thought they would be inclined to alter their previous opinions, and regard the course taken as the right one. If the Directors had not gone to Parliament, it would have necessitated the formation of a new company to supply the extended area of the city. He thought the Shareholders could not but congratulate the Directors that they had taken Time by the forelock, and not only that they went to Parliament when they did, but that they had successfully carried their Bill through. It was true they had not obtained all they desired; they had not received power to manufacture sulphate of ammonia, which, he thought, would have resulted in a profit to the Company, and from which the citizens would have derived benefit, as it would have enabled them to sell gas at a lower rate. It also would have introduced a new industry into the city, and it was desirable to extend the trade as far as possible, so that the city kept pace with the other towns in the kingdom. There had been a great deal of talk about the gas manufacture being a nuisance to the neighbourhood where it was carried on; but he was confident that was very much exaggerated, for he had made inquiries in places where the manufacture was conducted, and found that no nuisance was caused by it.

The report was then adopted.

The CHAIRMAN next proposed a resolution confirming the dividend as recommended in the report, after which he moved the re-election of the Directors for the ensuing year, which was agreed to.

The meeting was then made special, and

The CHAIRMAN moved the following resolutions:—"That, in pursuance of the notice given by the advertisement convening this meeting, the additional further capital authorized to be raised and created by the Company, by the York United Gaslight Company's Act, 1878, be raised and created, and that such new capital be raised in 8000 new ordinary shares of £10 each, and that the same be apportioned amongst, and appropriated and allotted to, the holders of shares as now registered in the Register of Shareholders of the Company, in the proportion of two new shares of £10 for every five old shares of £5 each, held by such Shareholders." "That calls on each of such 8000 shares be made in such amounts, and payable at such time or times, and at such place or places, as the Directors of the Company for the time being shall, in accordance with the provisions of the said Act, determine." "That all unapportioned, unappropriated, and unallotted shares which shall remain by reason of a fractional number of shares being held by any of the Shareholders of the Company, and which, therefore, cannot be apportioned and appropriated in the terms of the preceding resolution, be sold by the Directors by public auction, at such time or times as they shall think proper, and issued to the respective purchasers thereof, and that the net proceeds arising from the sale thereof be divided amongst and paid to the Shareholders entitled to the fractional shares in the proportions in which they shall be so entitled."

This was seconded by Mr. TAYLOR, and passed without discussion.

Mr. J. F. TAYLOR said that they all must have admired the very modest way in which the Chairman had alluded to the obtaining of the new Act of Parliament. In promoting that object the Chairman had laboured arduously and patiently during all the time that the Directors had had the struggle in hand. He (Mr. Taylor) would not underrate the opposition they had had to contend with, nor would he magnify it, but, as the Chairman had happily observed, they had had to put their shoulders to the wheel to achieve their object. The opposition at one time looked very threatening and very serious to the interests of the Company, but at last it was their pleasure to hear the Chairman of the Parliamentary Committee say that he thought that, of all places in the kingdom, York was the most desirable to reside in, that their Bill was a very meritorious one, and that if the Company had asked for more than they had there would have been no hesitation in granting their application. However, on the whole, they were satisfied, and he thought they had obtained a good Act, and one which would add to the prosperity of the Company, and enable them to meet the growing demands for gas which every month were coming upon them. The Board of Directors had done what they could, but the guiding hand was that of the Chairman, to whose untiring industry and sound common sense the Company were greatly indebted. A spirit of conciliation had always been manifested by him, and his remarks showed that he desired all unpleasantness to be forgotten. He (Mr. Taylor) hoped the time was not far distant when something more than a mere verbal expression of thanks would be tendered to him for his conduct in the late application to Parliament, and that something more tangible would be presented to him. He was not in a position to say more at present, but he hoped when the time arrived they would present to their worthy Chairman some unmistakeable proof of the esteem in which they held him.

Mr. J. L. FOSTER endorsed every observation that had fallen from Mr. Taylor. He (Mr. Foster) had business in London during the time the Chairman was there in connection with their Bill, and he thus had an opportunity of witnessing the exertions, the labours, and the anxiety that he bestowed in promoting the measure. The Company were, indeed, greatly indebted to him for what he had done.

The CHAIRMAN said he highly appreciated the manner in which his endeavours had been referred to by the two previous speakers, and the way in which they had been received by the Shareholders. It was a mark of their esteem and confidence which he would not soon forget. It was true that he had done his best to promote the interests of the Company, but his brother directors had also done the same, and had done their duty cheerfully. He thanked them for the compliment they had paid him.

Mr. J. R. HILL then proposed a vote of thanks to the Directors for the manner in which they had managed the affairs of the Company during the past half year, and for their extra labours in connection with the Act of Parliament. Their labours in the past had given the Shareholders confidence in them, and they believed that the hope expressed by the Chairman would be fulfilled—namely, that in the future the Company would be increasingly successful and popular. In the past they had been successful, and deserved to be popular.

Mr. W. W. HARGROVE, in seconding the resolution, concurred in the remarks of the previous speaker that there had been much patient labour and the exercise of great conciliation, and said that they would be remiss in leaving that room without cordially expressing their thanks, not only to the Chairman, but to the whole of the Directors, for the special services they had rendered on that important occasion.

The CHAIRMAN replied, and the meeting terminated.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held on Monday, the 29th ult.—The Rev. Dr. PHELPS, Master of Sidney Sussex College, in the chair,

The Directors, in their report, recommended that a dividend for the half year, after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the amount paid up on the new shares, with 1 per cent. on the consolidated stock, to complete the deficiency for the half year ending Midsummer, 1868, be paid on the 1st of August, free of income-tax. Contracts for carrying out the new works referred in the last report had been entered into with Messrs. Redding and Son, of Cambridge, for the necessary buildings, and with Messrs. Piggott and Co., of Birmingham, for the ironwork, at sums amounting to upwards of £18,000. To meet this expenditure it would be necessary to create additional capital.

The MANAGER (Mr. James Weeks) reported that a fair increase in the demand for gas had been maintained. The works in connection with the extension of manufacturing plant were progressing satisfactorily, and he hoped to have the new purifying-house in use during the ensuing winter.

It was proposed by the CHAIRMAN, seconded by Dr. DROSIER, and carried, that the reports be received and entered on the minutes.

The CHAIRMAN proposed, it was seconded by Mr. J. SWAN, and carried unanimously, that the dividends mentioned in the Directors report should be declared.

Mr. PEED proposed, and Mr. FITCH seconded, that Mr. J. Death be re-elected a Director of the Company. Carried unanimously.

On the motion of Dr. FAWCETT, seconded by Mr. FRENCH, Mr. W. Clayton was also unanimously re-elected a Director of the Company.

It was proposed by Mr. PEED, seconded by Mr. FRENCH, and carried unanimously, that Mr. Edmund Foster be re-elected an Auditor of the Company.

On the motion of Dr. FAWCETT, seconded by Mr. PEED, a vote of thanks was passed to the Chairman for his able conduct in the chair, and the proceedings terminated.

YORK NEW WATER-WORKS COMPANY.

Last Thursday, the Half-Yearly Meeting of this Company was held—Mr. J. F. TAYLOR in the chair.

The SOLICITOR (Mr. J. P. Wood) read the following report:—

The revenue of the Company continues materially to increase.

A considerable sum has been expended in the repairs and cleaning of reservoirs, and repairs of mains and works generally, which has been charged to revenue. The new works at Acomb landing have progressed in a satisfactory manner. The £3000—the remaining portion of the mortgage of £8000 on the Old Company's works—has been paid off.

The Directors recommend that a dividend of 8s. per share on the ordinary shares for the past half year, being at the rate of 8 per cent. per annum, and a dividend of 5s. per share on the preference shares for the past half year, being at the rate of 5 per cent. per annum, be declared; and that a dividend of 6d. per share on the new shares, 1878, from the 1st of April to the 30th of June last, being at the rate of 5 per cent. per annum, be also declared; and that the same respectively be paid without deduction for income-tax on and after the 6th day of August next.

Messrs. T. and C. Hawksley, the Engineers, have presented the following report as to the progress of the works at Acomb landing:—"1. That the difficulties presented by the nature of the natural foundation having been successfully overcome, the engine-house has been carried up to its full height, and is now being covered in. 2. That the boiler-house is more than half built, and is expected to be roofed in in less than two months. 3. That the base of the chimney is well advanced, and that the entire shaft may be expected to be completed before the end of October. 4. That all the boilers are fixed and connected, and that the heavy ironwork of the engines is now being rapidly forwarded and placed; we expect, therefore, that the engines will be finished and brought into action by the end of the year. According to all appearances, the buildings and machinery will be sound, strong, and satisfactory."

The CHAIRMAN moved the adoption of the report, and, in doing so, congratulated the Shareholders upon the continued success of the Company. The half year's water-rents amounted, he said, to something like £500 more than those of the corresponding half of last year. This was a very gratifying increase, and when they remembered the new houses that were being erected in the suburbs of the city, all of which would require a supply of the article which the Company dispensed in such abundance, it was, perhaps, no wonder that the rents increased. Referring to the construction account, they had expended considerable sums of money on new works during the past half year. There was no doubt that in the first instance the cost of those works was large, but they were carried out in a very substantial manner; and, in order to make them equal to the requirements of the city for many years to come, that expenditure was necessary. They were also reconstructing the old filtering-beds—those that were first put down—in a substantial manner, so as to serve for many years to come. The Directors could not hold out any prospect of a diminution of the expenses under this head for some time to come, for in different parts of the city they had to extend their mains. In Bootham a trunk main ought to be put down, as the present trunk main extended no further than Gillygate. The requirements in the Fishergate district were also increasing. The new barracks would require an extra supply of water, and this would necessitate an extension of the trunk main in that district, so he was glad to say this item would not be decreased for two or three half years to come. He was glad that the old mortgage, which had long been an eyesore to the Directors and to the Shareholders, was now paid off, and included in the new capital which had been raised. Some of the Shareholders would probably desire to know when the Directors would require to raise more money. In reply to that, he would say that they would want some on the 1st of October, and that therefore a call would be made, which he had no doubt would be responded to as cheerfully as the last was. He hoped that when the new works were completed an opportunity would be afforded to the Shareholders to see what had been done.

Mr. J. L. FOSTER seconded the motion, and the report was adopted.

Mr. RYMER said that the Shareholders had from time to time had very satisfactory reports presented to them, but he was bound to say that the present report was more satisfactory than any that had preceded it. Although they had an increase of £500 in the water-rents, they had expended more upon repairs and renewals than in the corresponding half year; and not only had they done that, but they had a larger balance left from which to pay the dividends than they had ever had before. After the dividend was paid they would have £3439 to carry forward.

Two years ago the amount carried forward after the dividend was paid was only £1713. All that was evidence that they had a valuable property, and that they might soon expect to have an increased dividend.

Mr. W. C. ANDERSON hoped that the Directors would not increase the dividend, for it was far better to have a regular dividend than to have 10 per cent. at one time and 5 per cent. at another.

The CHAIRMAN referred to the lowness of the water in the river, and said that their intake was 13 feet below the summer level, and that they need have no fear that the supply of water would be materially diminished.

The dividends, as recommended in the report, were formally declared, and a vote of thanks was accorded to the Directors, on the motion of Mr. ANDERSON, seconded by Mr. RYMER.

The meeting then terminated.

NORWICH WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held on Wednesday, the 24th ult.—Mr. H. S. PATTESON in the chair.

The SECRETARY (Mr. R. Cooper) read the following report:—

The accounts of capital and revenue for the half year ending the 25th of March last have been duly examined and certified to be correct by the Auditors of the Company.

The revenue account shows that, after payment of the working expenses, debenture interest, and dividend on the preference shares, there remains a sum which enables the Directors to pay a dividend at the rate of 6 per cent. per annum on the ordinary shares, and to carry forward a balance amounting to £624 1s. 5d. to the credit of the next half year's account, and the Directors have, therefore, declared a dividend at that rate, which will be paid to the Shareholders on the 1st of August next.

The Company's works and property are maintained in the most efficient order and condition, and the supply of water to the city is excellent.

It is with sincere regret the Directors announce the death of Mr. Henry Back, who had been one of the Directors of the Company for some years.

The CHAIRMAN moved—"That the report now read be received and adopted, and that the same be printed and circulated among the Shareholders." He said he had nothing to add beyond what he had stated at many half-yearly meetings—that nothing could be in a more satisfactory condition than the Company's works, and that the water supplied was excellent. Last week he inspected the works at Heigham, and it was a treat to see the admirable state they were in. The reservoirs at Lakenham were full of bright pure water. But what was exceedingly satisfactory was the fact that the customers of the Company were increasing. Constant applications were being made for an extension of mains, and there was a gradual increase in the rates. It was with great regret that the Directors had to announce the death of Mr. Back, a most useful member of the Board, from his knowledge of machinery and works.

Mr. BACON seconded the motion, which was unanimously adopted.

Mr. MAGUIRE inquired whether the debenture interest was all at the same rate.

The CHAIRMAN replied that there was none higher than 4½ per cent., and that when debentures were renewed it was at 4 per cent.

Mr. HAWKSLEY, the Consulting Engineer of the Company, said that every word contained in the Directors report was perfectly correct, except that they had rather understated than exaggerated the perfection of the undertaking. He never saw the works in a better condition. Everything was sound and good, and to all appearances maintained in a condition which promised durability. Of all the works which he professionally visited, the Norwich works were always kept in the best order. The management of them was excellent. He was constantly in the habit of telling other companies what was done at Norwich, and commending their officers in different departments to visit Norwich, to see what the officers of the Norwich works were doing. The system of a constant supply was most perfectly maintained at Norwich, with so small an amount of waste that Norwich was a pattern for the whole kingdom. They had no wish, of course, to pat each other on the back, yet he thought they ought to recognize that not only the Norwich Company, but the whole kingdom, were indebted to Mr. Ayris for accomplishing what many companies had failed to do, because they did not know how to proceed. He hoped that for many years the Company would continue to have the benefit of the services of Mr. Ayris.

The CHAIRMAN said he agreed with what Mr. Hawksley had said, that a great deal of the success of the Norwich Water-Works was owing to the excellent management adopted by Mr. Ayris. His discipline, order, and regularity kept everything in its place. Firm and decided, yet kind with the men, nothing went wrong. It was, therefore, not as a mere matter of form that he proposed that the thanks of the Shareholders be given to Mr. Ayris for his able management.

Mr. MAGUIRE seconded the vote, which was unanimously passed.

Mr. AYRIS, in reply, said that the Norwich Water-Works had given him much pleasure, and if the Shareholders received any benefit from his services, that pleasure was enhanced; but as the Shareholders had always considered him, and he had to thank the Norwich Water-Works for the position he held in the country, the benefit was mutual.

The CHAIRMAN, in answer to Mr. Maguire, said that the covered reservoirs would be sufficient to meet the requirements of the population for a long time to come; but in the course of two or three years there would have to be a new engine and boiler, the cost of which would most likely be met by a growing surplus, so as not to affect the dividend.

Mr. MAGUIRE moved, and Mr. J. FITCH seconded, a vote of thanks to the Chairman and the Board of Directors for their services.

The CHAIRMAN, in reply, assured the Shareholders that every sixpence of expenditure was checked before it was allowed. In reply to Mr. Dix, he stated that the Directors had elected Mr. Pymar to be a member of their body in the place of Mr. Back, deceased; but they did not intend to announce it till the next meeting.

This concluded the business.

WELLINGTON (NEW ZEALAND) GAS COMPANY.

The Annual General Meeting of Shareholders was held at the Company's Offices, Courtenay Place, Wellington, on Monday, the 4th of February last, when the following report and statement of accounts were presented and adopted:—

The Directors, in presenting the annual statement of accounts, have to report that the business of the Company has greatly increased during the year, and still continues to do so.

The available profit is £5004 19s. 6d., and a sum of £1350 was paid in July as an interim dividend at the rate of 5 per cent.; the Directors recommend the payment of a dividend at the rate of 10 per cent. for the last half year, and on the new capital 10 per cent. from date of payment; also, to place a sum of £1000 to reserve and carry forward the balance.

The net price of gas has been reduced 1s. per 1000 feet since the end of the year, the price now being 15s. per 1000 feet, with a discount of 4s. per 1000 feet for prompt payment in place of 3s. per 1000 feet as hitherto.

The extension of retort-house and purifying plant was completed in July last.

The mains have been extended about 2½ miles during the year.

The number of consumers now exceeds 900.

By ship *River Lecen*, due at an early date, a supply of material for extending the mains, and for a large gasholder to contain 180,000 cubic feet of gas, will arrive. It is anticipated that the gasholder will be ready for use for next winter. An 8-inch main will be laid from the works along Cambridge Terrace towards Newtown.

Further extensions of the retort-house will be required for the winter of 1879.

Balance-Sheet to Dec. 31, 1877.

Dr.				Cr.			
Capital—viz., 5000 shares of £10 each—				Immoveable property—			
2000 shares, fully paid up	£20,000	0	0	Works, mains, services, and meters	£40,266	8	6
1000 „ £7 „	7,000	0	0	Moveable property—			
2000 „ £1 „	2,000	0	0	Stock of meters, tools, and sundries	1,448	10	10
Calls paid in advance	21	0	0	Stock of retorts, coal, products, &c.	1,061	13	6
Reserve-fund	2,500	0	0	Stock of goods	625	0	0
Debentures	10,000	0	0	Debts due for goods, &c.	593	5	0
Debts due for coal	298	17	8	Gas-rates, 1877, due, and not yet paid	1,337	19	9
Deposits	17	0	0	Products, 1877	185	15	4
Profit and loss balance	5,004	19	6	Cash in hand, and balance in bank	1,323	4	3
	£46,841	17	2		£46,841	17	2

Profit and Loss Account.

Dividend and interest to Dec. 31, 1876	£2,034	19	11	Balance, Dec. 31, 1876	£3,057	5	1
Reserve-fund	500	0	0	Gas-rates and meter-rent	14,757	3	10
Amounts written off	116	7	4	Products	548	15	6
Interim dividend, June 30, at 5 per cent.	1,350	0	0	Goods	247	18	4
Cost of coal, wages, &c. £9,217 13 2				Premium on shares	61	19	3
Less stock in hand 1,061 13 6				Fees	4	11	6
	8,155	19	8				
General expenses—							
Directors	75	0	0				
Salaries	589	11	8				
Interest	383	16	2				
Legal charges	37	4	8				
Insurance	70	1	0				
Annual licence	25	0	0				
Rates	60	0	0				
Stationery and advertising	112	14	6				
Sundries, pettys, and stamps	151	9	1				
Auditors	10	10	0				
Balance	5,004	19	6				
	£18,677	13	6		£18,677	13	6

HOKITIKA (NEW ZEALAND) GAS COMPANY.

The Ordinary General Meeting of Shareholders was held in Hansen's Post Office Hotel, Hokitika, on Wednesday, May 22 last, when the following report of the Directors was presented and adopted:—

The Directors, in submitting their fourth annual report and balance-sheet, have to congratulate the Shareholders on a considerable improvement in the position of the Company.

During the year, sub-mains have been laid, whereby 36 additional consumers for lighting, and 8 for cooking purposes have been secured, thus making the number of consumers up to 415.

The works of the Company continue to give every satisfaction, and your Directors have taken all necessary steps to maintain their efficiency.

Two benches of new retorts have been set, and others are in stock for future use.

From the statement of accounts it will be seen that there remains a balance of £1192 5s. 11d. to credit of profit and loss, after deducting the interim dividend of 6s. per share, amounting to £600, paid in November last. Out of this sum your Directors recommend the payment of a further dividend of 8s. per share, which will absorb £800, leaving a balance of £392 5s. 11d. to be carried forward.

In accordance with the resolution adopted by the Shareholders, the necessary steps were taken to obtain an Act of the Legislature for the Company. This was passed during the last session of Parliament.

Statement of Accounts, for the Year ending April 30, 1878.

Dr.				Cr.			
Balance in bank, April 30, 1877	£101	16	0	Dividends paid Shareholders	£1100	0	0
Gas-rates and meter-rents	3942	17	10	Plant, meters, and premises	274	0	3
Coke, tar, and products	111	7	8	Stoves, lamps, and fittings	90	9	1
Stoves, services, and tanks	123	11	6	Coals and lime	1531	8	1
Transfers	1	5	6	Wages—manufacturing, and purifying	466	10	0
Balance due bank, and cheques unpaid	49	16	1	Salaries and allowances	502	4	0
				Parliamentary Bill	215	0	0
				Expenditure (sundries)	151	2	8
	£4330	14	1		£4330	14	1

Profit and Loss.

Interim dividend for this year	£600	0	0	Balance, April 30, 1877	£605	11	9
Coals and lime	1504	8	1	Less dividend then declared	500	0	0
Wages	466	10	0		£105	11	9
Salaries and allowances	502	4	0	Gas-rates and meter-rents	3942	17	10
Expenditure (sundries)	151	2	8	Sundry products	111	7	8
Lamps	63	13	0	Stoves, fittings, and transfers	56	4	5
Parliamentary Bill	215	0	0	Accounts due and unpaid	598	12	6
Depreciation (meters)	100	0	0				
Bad and doubtful debts	19	10	6				
Balance	1192	5	11				
	£4814	14	2		£4814	14	2

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from p.* 165.)

The following is the discussion on Mr. Macpherson's paper, entitled "How should the Value of Gas be Determined?"—

Mr. WATSON (Stirling): I would like to know where the governor was placed when the experiments were made.

Mr. MACPHERSON: Before the meter, and the governor used was a small house (Sugg's) governor.

Mr. WATSON: You get the full pressure when the gas goes into the meter from the mains, and I think, sometimes, that the varying pressure in the mains makes a considerable difference in the registration. Of course it is different when the governor is on. I think you could scarcely get a steady flame with the meter supplied from the regulator.

Mr. YOUNG (Clippens): I believe I am one of those who have differed from Mr. Macpherson in expressing my opinion that there is not a fixed rational relation between the illuminating power, durability, and condensation by bromine. Mr. Macpherson, in his present paper, has made no allusion to condensation by bromine in relation to illuminating power; and I take it for granted that he has given up the position that there is a fixed rational relation. However, I may be permitted to make a few remarks on the subject. Taking a variety of the hydrocarbons to be found more or less in all coal gas, and which go to give it illuminating power, we find hydrocarbons of the marsh gas, olefiant gas, and benzole series, some of which only are condensable by bromine, and all occupying different volumes in proportion to the carbon of their constitution, and giving, when burned, very different amounts of illuminating power. Now, we shall suppose two gases, of one of which the illuminating power is due, in great part, to the marsh gas and olefiant gas series, such as is produced from shale and poor parrot coal at low temperature; and the other, in which the illuminating power is due principally to the presence of an extra quantity of benzole vapour, produced from splint or other bituminous coal at high temperature. It is quite evident that the relative

volume of vapour condensed from these two gases by means of bromine would give no correct indication of their illuminating power, because the dense vapours of benzole would give, perhaps, something like three or four times the illuminating power of that given by members of the olefiant gas series, condensed from the other gas; and yet both might indicate the same volume of hydrocarbons present in the gas, and consequently, so far as the bromine test was concerned, the same illuminating power. Then in regard to the durability test, Mr. Macpherson has made the statement that the carbon present in coal gas, and the amount of illuminating power, hold a proportional relation to each other. He has made reference to the various combinations into which carbon enters, both with oxygen and hydrogen; but in so far as oxygen is concerned, only to its combination as carbonic acid gas. Now, I hold the opinion that it very much depends upon how the carbon is combined with the other elements present in the gas, what is the amount of illuminating power derived from it, and in all coal gases we have a proportion of the carbon combined with the oxygen to form carbonic oxide gas—another form in which carbon combines with oxygen—and I think it is more particularly in relation to this form of combination of carbon and oxygen gas which influences the durability test in altering the rational proportion between it and the illuminating power. Suppose we were to build up two forms of illuminating gas; in the one case, we shall take a given volume of hydrogen, and add thereto a given volume of hydrocarbon vapour; and, in the other case, we shall take a similar volume of carbonic oxide gas, and add to it a similar volume of hydrocarbon vapour; we shall find that, on being consumed, they give very unequal amounts of light. Some valuable statistics were lately published in the JOURNAL OF GAS LIGHTING relative to this matter, showing conclusively that from a given volume of benzole vapour, when diffused through a given volume of hydrogen, a greater illuminating power was produced than when the same volume of benzole vapour was combined with carbonic oxide gas, although in the latter form a greater per centage of carbon was present. When hydrogen, and hydrogen in combination with carbon as a hydrocarbon, are consumed, both elements take up their full combining proportion of oxygen, two atoms of hydrogen combining with one atom of oxygen to form water, and each atom of carbon combining with two atoms of oxygen to form carbonic acid; but when carbonic oxide and hydrocarbon vapour are burned, we do not obtain the same result. The hydrogen and the carbon of the hydrocarbon vapour combine each with its full proportion of oxygen, but the carbon of the carbonic oxide having already combined with one atom of oxygen is, so to speak, half consumed, and only takes up one atom of oxygen to form carbonic acid, and, as you are aware, this gas exercises a very deleterious effect upon the illuminating power. Its presence, either in the gas or in the surrounding atmosphere, enlarges or increases the size of the flame, but decreases the illuminating power; and I am persuaded that Mr. Macpherson has only to make experiments in the way of building up gases, to satisfy himself that gases containing variable proportions of carbonic oxide and hydrogen, and hydrocarbons having the same per centage composition of carbon and hydrogen, but in different forms of combination, and having different vapour densities, do not give the same relative durability, and that there is great difference in the illuminating power from equal quantities of carbon present in a gas, dependent upon the state in which it is combined. It is a fact that different coals yield gases having very variable proportions of carbonic oxide and hydrogen in their constitution, and that they contain variable proportions of hydrocarbons having very different constitutions and vapour densities; and although I am ready to admit that there is, in the majority of cases, a certain approximate relation, in all coal gases, between durability and illuminating power sufficient to make durability a handy approximate test, yet the relation is not in exact proportion to the increase and decrease of the illuminating power, nor yet is the illuminating power in exact proportion to the carbon present in the gas. Then Mr. Macpherson refers to the durability of a gas as affecting its value to the consumer. I am scarcely in accord with him even in this. He instances a gas which, having a given illuminating power, may, by having a greater or less durability, have a greater or less value to the consumer. Now, to my mind, so far as the consumer himself concerned, it is all much the same. What he really purchases is so much light. If he be supplied with 5 cubic feet of gas of a given illuminating power, it is immaterial whether it is burned a little more quickly or slowly, the same gross amount of light would be given out, but ex-extended over a shorter or a longer period of time. If he were supplied with a gas having a low durability, he would get a greater amount of illuminating power from a given sized burner, due to the increased quantity passed; but if he only proportionately lessened the burner, he would obtain the same result as if he had been consuming the gas of the higher durability with the enlarged burner. I am taking it for granted that the difference in the gases is such that they can be consumed with equal advantage. Of course, we all know that if we go above or below a certain consumption, there is diminished illuminating power; but, practically, I can see no difference in the value of the gas to the consumer, in so far as durability is concerned, in the instance referred to. We find that the gas produced by the Aitken and Young process, due to its constitution, is considerably lower in its durability, in relation to its illuminating power, than with gas made in the ordinary way, but because the durability is lower, I do not find that it detracts in any way from the value of the gas—if anything, it would rather enhance it, as it enables it to be distributed through smaller mains, and a house having fittings insufficient for a higher durability would be sufficient for gas made by this process, because the gas passes through a smaller orifice. In so far as the consumer is concerned, he would not suffer—he purchases light, and not volume.

Mr. MACPHERSON: Yes; but he pays for volume.

Mr. YOUNG: Exactly, but in conjunction with its illuminating power; and were it possible to supply him with such a gas that one cubic foot would give him the light of 5 cubic feet of another gas, he would require a supply-pipe with only one-fifth the capacity, and a burner to deliver one-fifth the volume of gas to give the same light, and he could afford to pay as much for one foot as for five of the inferior quality.

Mr. MACPHERSON: But my statement was a durability of 59, as compared with 54 minutes, and both having the same illuminating power.

Mr. YOUNG: I am obliged to Mr. Macpherson, because by these explanations we can more fully understand each other. It was for the sake of illustration that I selected the difference in the illuminating power, instead of the durability, and I purposely exaggerated the difference in order to convey my meaning. Suppose we have a gas, of which one cubic foot would give the light of five, and that we could burn both gases with equal advantage; suppose we have gas containing as much illuminants as would give to one cubic foot the lighting power of five, the public would only have to limit their burners to one-fifth of the volume, and yet have the same amount of light; and it is light the consumer pays for.

Mr. MACPHERSON: But the public pay the same rate per 1000 feet, and with the one gas have a durability of 59 minutes, and with the other only 54 minutes; consequently, the public would have to consume more gas.

Mr. YOUNG: But, as I have already explained, if the public consume more gas, they have proportionately more light; and, if they have more light than they require, the public can decrease the light, and so the consumption. In reality, the consumer pays so much per unit of light, and not so much per cubic foot; and, so far as the consumer is concerned, with 28-candle gas he gets the same amount of light for a given amount of money, whatever be its durability. If he burns as much 28-candle gas as gives the light of 100 candles per hour, he will burn the same quantity of illuminating gas whatever be its durability, and it is immaterial to him what he pays for it, provided he pays so much per unit of light.

Mr. MACPHERSON: I think I see what you are driving at; but I do not think the argument will hold.

Mr. PEEBLES: If I buy two candles and light them, and if the one burns for five hours and the other three, which is the better candle?

Mr. MACPHERSON: What Mr. Young means is, that you get the same light; but he does not seem to take into consideration that it is impossible to go so minutely into the question of burners as to regulate that light to the consumer, so that it is the durability with which the consumer has to do.

Mr. YOUNG: I am sorry, gentlemen, that I have apparently failed to convey my meaning; but, perhaps, by allowing the discussion to proceed, the nature of the argument involved may be made clear, and, perhaps, the Chairman may kindly allow me again to address the meeting at the close of the discussion.

Mr. M'CRAE: Mr. Young has not attempted to discuss the merits or demerits of one sentence contained in Mr. Macpherson's paper. As I understand the paper, Mr. Macpherson showed to us, and showed it very well, that the popular mode of testing the illuminating power of gas by the photometer is fallacious, and that the durability test is the test to discover the real quality of the gas. I am disappointed in Mr. Young. This is the first time I have had the pleasure of hearing his voice, and I expected, when he started to his feet, that we would have obtained some light on the subject, but he has not touched on the point at issue. If he could have told us from his own experience that the statement by Mr. Macpherson, that tests by the photometer are fallacious, is not correct, or if he could have shown that they are not fallacious, and that we might depend upon them, then there would have been something to go upon, but he has not touched upon that. Mr. Macpherson ought to be supported by those who have had experience in these matters. Well, talk as we will about the photometer, the photometer of my experience is fallacious. I happen to have the charge of a pretty big town, and I never, curiously enough, from one year to another, put my nose to the photometer. It is done by others, and beautifully well; but, at the same time, those who do it are candid enough, and honest enough, to say they do not believe it. We have people coming to tell us that the gas was really magnificent in one month, when I was aware that it was no better than when these same people had been finding fault. At this moment, I am told it is really beautiful, and I am not going to say what it is, as the reporters are here. This is an explanation of the irregularities that occur with the photometer, not so much as the want of harmony between durability and the photometer. There is harmony between the two, if we could only get the machinery and the eyes to work together; but the adjustments are so fine that the mistake of a figure leads to very erroneous results. I support the theory of Mr. Macpherson, that the durability test has the most value to the consumer. If gas is given out to last 59 minutes, I am giving a certain value; but if I give gas at 54 minutes, I know that the people are paying that per centage more for the light which they are getting.

Mr. HISLOP: I fear that we have lost altogether the point which Mr. Young attempted to convey, with some force, to the meeting, and that is, when gas contains carbonic oxide, it increases the length of the flame in undue proportion to the illuminating power, as tested by the photometer. I quite comprehend that the condition of the coal used may affect the point, and that this very much accounts for the difference that may be found in testing different gases, and in making a comparison between the illuminating power and durability. For instance, we find it not uncommon for purified gas to contain 5, 6, and sometimes 8 per cent. of carbonic oxide. Now, it must be clear, although experiments have not been gone into to determine correctly the difference, that a difference must result from such variable proportions of carbonic oxide present.

Mr. MACPHERSON: Do you state that from actual fact?

Mr. HISLOP: I am stating this from what we find in purified gas, but, as I have already said, experiments have not been made with a view to determine the point accurately.

Mr. MACPHERSON: Then you are merely speaking from supposition?

Mr. HISLOP: I have not determined it from actual experiments. So much for that. Then in regard to the difference due to the quantities of the other gases, undoubtedly it varies with the condition in which coals are when examined, and with the different coals used. Coals, it may be, are delivered into the works well saturated with water, or so dried that they are in the condition of having been in store for many months. Now, if you reduce the per centage of water, the illuminating power of the gas and general results will be materially improved, so that this very much accounts for the difference found to exist between different experimentalists. Then another thing is the condition of the gas in regard to the absence or presence of carbonic acid, to which Mr. Young has referred. If care is not taken in every case to see that the gas is thoroughly purified, and carbonic acid absent, this in any experiments between illuminating power and durability may be a serious source of error, and I fear this is a matter which is not sufficiently regarded. In experiments conducted by myself, if I find that purified gas contains carbonic acid, before I proceed with my tests I immediately discard it altogether. You are all aware that the presence of carbonic acid in purified gas very much affects its illuminating power. I may here mention, in connection with the remarks on the defects of photometers of various constructions, that a paper was read a week or two ago, at the British Association Meeting in London, at which I was present, by Mr. Methven (London), on a substitute for the candle, which, in my opinion, promises very well to meet the object intended. I may say, in a word, that it is composed of a strip of brass, in which there is a slit about 1¼ inches long, and ¼ inch wide, placed immediately in front of an Argand burner, and taking in a certain area of the flame, and equal to two candles. That has been found by Mr. Methven and Mr. Sugg to take in an area equal to the requirements of gases having illuminating powers varying from twelve candles and upwards. To my mind, the thing seems very feasible indeed, and if it can be proved in practice to be correct, it will be of immense advantage to those concerned in gas-works management. Something of the same kind was tried by Mr. Fiddes, of Bristol, many years ago. It was proposed to take a certain Argand burner, with a brass funnel, having a hole in it of 1½ inches from the top of the burner, and three-eighths of an inch in diameter. The light emitted through that hole was equal to one candle; but, when the quality of the gas was altered, the method was found not to be satisfactory. Mr. Methven has overcome this difficulty by elongating the slit. This may meet the difficulty that has been urged against the use of the candle, and enable us to ascertain the illuminating power of gas with greater certainty, and much more quickly.

Mr. WATSON: I would like to know how you can prove that. Perhaps

you would tell how carbonic oxide is made, so that we might experiment ourselves.

Mr. YOUNG: There are a variety of ways in which carbonic oxide may be manufactured, which can be learnt from any chemical text-book. The manner in which I was first made aware of the effect of mixtures of carbonic oxide affecting the relative durability and illuminating power was when experimenting with water gas which contained some 25 or 26 per cent. of carbonic oxide. When carburetting such a gas with various hydrocarbons, I found the durability in relation to the illuminating power to vary very considerably, and even when carburetting poor coal gas, or diffusing through ordinary coal gas an extra volume of the vapours of the hydrocarbons from the tars, I obtained results showing a different relation between the durability and the illuminating power. In quoting results, therefore, I quote from actual experiment, these experiments being corroborated by Dr. Wallace, as well as by the various Members of the West of Scotland Association of Gas Managers who investigated the Aitken and Young process at Hamilton. I am certainly obliged to Mr. M'Crae for giving me the pat on the head he has done, as I have generally experienced that such has a stimulating effect. The greater the difficulties, the more determinedly have I from my disposition striven to overcome them; and if the soothing effect of the clap on the head which Mr. M'Crae gave me towards the close of his remarks has not a counteracting effect—for I do not at all like smoothing over—perhaps it may have the effect of helping me to clear up the subject upon which, I fear, I, to a certain extent broke down, or, at least, failed to convey my meaning. Notwithstanding all that Mr. M'Crae has said, I take some little credit to myself for having done something towards the clearing up of the particular subject under discussion. I may state that I never read a paper with greater pleasure than Mr. Macpherson's first paper on the subject of the relation between condensation by bromine, durability, and illuminating power. So much was I interested in the subject that I sent for Mr. Cusiter's book of analyses, went carefully over his analyses, and even took the trouble of drawing up a tabulated analysis of his results, which has since appeared in the JOURNAL OF GAS LIGHTING. That table shows that Mr. Cusiter did not find a fixed relation between the condensation by bromine, the durability, and the illuminating power; and I believe there was not a more careful experimentalist connected with the gas trade than my late brother-in-law, Mr. Cusiter. I have further discussed the matter, and have brought the subject before this and other Associations, with the result that to-day Mr. Macpherson takes no notice of the relation of condensation by bromine and illuminating power; and I take it for granted that he has abandoned this theory. To return, however, to the subject of durability, Mr. Macpherson says that gas having an illuminating power of 28 candles, may so vary that it may have 54 and 59 minutes durability, and that this difference of durability should be taken as a criterion of its value to the consumer. Now, if you burn 5 cubic feet of 28-candle gas with a durability of 54 minutes, you get the whole illuminating power of 28 candles in that time; consequently, per unit of time there would be a greater amount of light than from the gas which would last for 59 minutes. But, were the burner to be reduced in size so as to consume the 54 minutes gas in 59 minutes, the same amount of light would be produced as when using the 59 minutes gas with the larger burner. Reversing the illustration—the 28-candle gas having a durability of 59 minutes would give the same gross amount of light, but less light per unit of the time, than the 54 minutes gas; but by enlarging the burner to cause the whole 5 cubic feet to be consumed in 54 minutes, the results would be substantially the same as when the 54 minutes gas was used. In both cases we have the same gross amount of light, but spread over different periods of time. Or let us take Mr. Peebles's illustration of two candles. For the sake of easy calculation I shall suppose that each of the candles weighs 1200 grains of sperm, but that one would last twelve hours and the other ten hours; or, in other words, the one consumes at the rate of 120, and the other 100 grains of sperm per hour. Both candles, when consumed, would give the same gross amount of light, but the one would give 120 units of light per unit of time, and the other 100, due to their respective rates of burning.

Mr. MACPHERSON: Mr. Young is so far right. I see what he is driving at; but we cannot go into the question of burners strictly. For burning both gases, you must take the value of the gas as to the consumer. You cannot say, "We will reduce the consumption a hundredth of the amount of greater durability."

Mr. YOUNG: The consumer does not take his burner to the photometer to test the rate of burning; he simply uses a burner which gives him the light he wishes.

Mr. MACPHERSON: I argue upon the commercial value of the gas as supplied to the consumer.

Mr. YOUNG: Take it as you may, he pays so much per unit of light.

Mr. MACPHERSON: But you must combine with that the durability, to arrive at the value of the gas to the consumer.

Mr. YOUNG: That is equivalent to the candle maker saying: "I will make a candle of two sizes, but of like weight. I will put into the one a wick that will burn for 54 minutes, and into the other one that will burn for 59 minutes."

Mr. MACPHERSON: And he sells them for the same money.

Mr. YOUNG: He sells them for the same money, but the purchaser gets no more light from the one than the other. The light is only spread over a longer or a shorter period of time. In a similar way, the consumer of gas uses a burner to produce the size of light he wants.

Mr. MACPHERSON: You cannot go so accurately into the question of the burner. I admit that your theory is correct.

Mr. YOUNG: That is all I have contended for.

Mr. M'GILCHRIST: I am sure we are all indebted to Mr. Macpherson for the able paper he has just read to the Association. There can be no doubt that the testing of the illuminating power by durability is, in ordinary circumstances, a satisfactory method. Mr. Young is quite correct in his contention that, if 5 cubic feet give an illuminating power of 28 candles, with a duration of 59 minutes, and the same quality of gas in another instance has a durability of only 54 minutes, you get the same amount of light in the lesser as in the longer period. I have long understood this to be the case.

Mr. PEEBLES: Will you allow me to refer to my candles again? They give ont the same quantity of light as they are burning, and I pay the same price for them.

Mr. YOUNG: They burn at different rates, however.

Mr. PEEBLES: These candles are the same weight, and give out the same amount of illuminating power. I get the same light as they are burning; but I find the one goes down 2 inches, while the other, in the same time, goes down only 1 inch. The one, therefore, that lasts longer is the better candle for me.

Mr. YOUNG: But you do not get the same amount of light per unit of time.

Mr. MITCHELL (Dundee): I coincide very much with Mr. Young, that, although the durability may be less, you have still the same amount of illuminating power. I intended to have asked a question upon this point, but the debate which has taken place saves me further referring to the matter. From experience I think there is a possibility of getting more illuminating power, and still having the durability in keeping with it. Although it does look as if the commercial value went with durability, yet, if you take it light for light, you get the same amount of light out of 5 cubic feet of gas, whether it burns five or twenty minutes.

Mr. MACPHERSON: The disparity is not so great in time.

Mr. MITCHELL: But, light for light, the consumer has the full value, whether the gas burns 54 or 59 minutes. At the same time, looking to the question from a popular point of view, it does appear that durability is the proper way of testing. I concur with other speakers that it is a difficult matter to use the photometer; but the greatest difficulty I have had has been with the candle. The conditions under which the candle burns, when making tests, often lead to very serious error; and, of course, the conditions under which the gas is burning are another source of error. The proper condition under which gas should be burned is more easily arrived at than that of the candle; at the same time, I do not think any durability test is free from error. In using a 4 or 5 inch flame, the great difficulty is to adjust the flame to 4 or 5 inches correctly, because the smallest variation will make a great difference in the length of time during which it would last. Also, I think, the burners would require to be uniform. Unless they were stamped and certified, the durability test would be a dangerous standard.

The PRESIDENT: I think we are much indebted to Mr. Macpherson for his paper. For practical purposes, I think Mr. Macpherson's plan a very easy one, and if the result of his remarks is to set us to try both the durability and the photometrical tests in our individual spheres, it will have the effect of benefiting us all. Therefore I think he deserves a hearty vote of thanks for the paper he has given us.

Mr. YOUNG: I beg to second the motion. I concur with some of the speakers that the durability test is a thoroughly practical one, and that there is none better for small gas managers, for it approaches within a small fraction of the truth; but, scientifically, I say it is physically impossible that it can be correct, because I knew, from a knowledge of the laws which affect gases, that it is impossible that they should bear a fixed determined relation one to another.

The motion was agreed to.

Mr. MITCHELL (Dundee) read a paper on

THE PROPER CONTROL OVER PRESSURE OF GAS FOR ILLUMINATING PURPOSES.

In compliance with the request of our President, that I should prepare a short paper for this meeting on some subject connected with our profession, I have put together a few sentences on the necessity for a proper control over the pressure of gas for illuminating purposes.

That such a necessity exists will be quite apparent when we consider that on the pressure at which gas is consumed depends, to a very large extent, the getting of the full benefit of its illuminating properties. Of the theory of combustion, and of the scientific principles on which are based the proper means of consuming gas to get the best illuminating results, much has been already written by many eminent chemists and gas engineers. Without, however, referring to these principles in detail, allow me to direct your attention to a very practical definition of the pressure at which gas ought to be consumed, in order to get the highest illuminating power, as given by Dr. Wallace in his lecture on the Bunsen burner last year, before this Association—viz., that the proper method of burning gas lies between the two extremes, that of the pressure being so low that a part of the carbon goes off in smoke; and the other extreme of high pressure, when the carbon is too rapidly consumed; and that the highest attainable value is obtained when the gas issues with such force only as is sufficient to enable the carbon to be consumed before it leaves the upper portion of the flame. In other words, the necessary condition is that the flame must be verging on the smoking-point, but still free from smoke. With the practical utility of this principle we are quite conversant in determining the illuminating power of our gas according to the recognized standard—viz., the flame consuming 5 feet per hour, as compared with the standard candle. The quantities of gas and sperm to be consumed are both fixed; but still the same quantity of gas may be consumed under very different circumstances as regards pressure, and give widely different results in illuminating power.

To get the best results, we select a burner capable of consuming the specified quantity at the lowest pressure without smoking, and, in proportion as this pressure is increased, the illuminating power is deteriorated. To show this practically, I have tested a flame burning 5 feet per hour at four different pressures, with the following results:—

Pressure.	Illuminating Power.
3-10ths	26·72 candles.
8-10ths	21·97 ,,
11-10ths	17·17 ,,
17-10ths	11·16 ,,

Taking 3-10ths as giving the best possible results—viz., 26·72 candles—by consuming the same quantity of gas at 8-10ths we have a loss of 17 per cent., at 11-10ths a loss of 35 per cent., and at 17-10ths a loss of 58 per cent. of illuminating power.

It is needless to say that we would never think of testing our gas under any such excess of pressure; but from such results, I think, we cannot fail to see something of the very destructive influence of pressure on the illuminating power of the gas.

The question now naturally arises—What are the circumstances, as regards pressure, under which the gas we supply is consumed? Do gas consumers generally have their gas supply under such control that they can take full advantage of its illuminating properties? I think the answer must be, that, by a majority of consumers, gas is burned under such excess of pressure that a large per centage of the light-giving constituent, instead of being utilized, is completely destroyed.

Without exaggeration, I think it may be safely conceded, that a large quantity of the gas we supply is used at a pressure not under 12-10ths of an inch. On this data I have tested a few of the burners in common use, showing the quantity of gas consumed, and the illuminating power, as compared with that given by using a similar—and even less—quantity at low pressure:—

Burner.	Pressure.	Consumption per Hour. Cubic Feet.	Illuminating Power. Candles.
No. 2, Bray	12-10ths	2·9	5·0
,, 2, Iron bat's-wing	12-10ths	3·1	7·0
,, 2, Iron union	12-10ths	3·5	8·5
,, 3, Bray	12-10ths	4·0	10·5
,, 6, Bray	3-10ths	2·7	12·5
Steatite bat's-wing	3-10ths	3·0	15·0

From these results it will be seen that the average consumption per hour of the first four burners is 3·37 cubic feet, and the average illuminating power is 7·75 candles; and here I would remark that this result does not show anything wrong with the burners—what is wrong, is the pressure at which the gas is forced through them. The other two burners

show an average consumption of 2·85 cubic feet, and an average illuminating power of 13·75 candles, the comparison of both results showing that 50 per cent. of light is lost in burning gas at 12-10ths pressure, as compared with burning at 3-10ths.

From this cause—viz., burning at high pressure—arise most of the complaints about bad gas and want of light. This may, however, be thought a matter for the consideration of consumers only, but, when we remember that they generally know nothing of the means of using gas to the best advantage, it can only be right for us, if we know anything of improved means of using the article which it is our profession to manufacture and supply, to communicate that knowledge to those who are ignorant.

How is this control to be effected? The only efficient way yet brought forward of securing a practically unvarying supply at low pressure is by a consumer's regulator.

The station governor at the gas-works, and the district governor, each in its own way, do something in effecting a control over the pressure; but from the various purposes for which gas is supplied, the distance at which it is used from the source of supply, the varied demands of different districts, the sometimes deficient piping—both main and service—and the very often deficient consumers fittings, a pressure must be maintained amply sufficient to supply the wants of every class of consumers; and this pressure also is subject to a constant variation, each consumer increasing, diminishing, or discontinuing the consumption, as suits his requirements or convenience. To illustrate something of the influence which distance, elevation, and the varied wants of different districts have on the pressure, I have here a diagram, the black line on which indicates the pressure at the gas-works during 24 hours, and the red line the pressure taken at a point fully three miles distant from the works, and at an elevation of about 820 feet above the same. You will notice that during the hours of least burning, when the pressure at the works is lowest, the red line, owing to the difference of levels, indicates highest; while, on the other hand, when the pressure at the works is highest, during the hours of heaviest consumption—the supply being drained off by intervening districts—the red line shows lowest. This is certainly an extreme case; but, no doubt, something similar takes places in every town.

The efficiency of a consumer's regulator consists in its controlling and maintaining a practically unvarying pressure at the burner, unaffected by changes in the initial pressure, or by variations of consumption. To show how far a regulator can fulfil these requirements, here is another diagram, showing the pressure at a villa situated about 1½ miles distant from, and at an elevation of about 60 feet above, the gas-works; the black line indicates the pressure at the inlet of the meter, and the red line the pressure immediately after the regulator.

It will be noticed that the pressure between the regulator and the burners only varies about 1½-10ths, while the number of burners in use during the lighting hours must, no doubt, to suit the household requirements, have varied very considerably.

In Dundee these regulators have been placed in factories, churches, public buildings, shops, and dwelling-houses, in every case being the means of giving increased light, and, in some instances, at less cost. This can be easily understood if, for instance, previous to the regulator being put on, the consumption had been such as is given in previous figures—3·1 cubic feet per hour, while at low pressure it may only be 2·7. It is found, however, that the desire on the part of consumers is not always to get the consumption reduced, but to take advantage of the better light; and here I would say that no better proof could be got of the benefit of burning at low pressure than to see the illuminating effect in a factory where 200 or 300 burners can be seen in one space, lighted up at 3-10ths pressure with No. 6 Bray's burners, as compared with the light given by No. 2 or No. 3 burners with, perhaps, 1 inch pressure.

With regard to the smaller class of consumers, who, in many instances, would be unwilling to adopt the regulator, a double burner—I mean a burner having a diminishing tip at the bottom—may be used to great advantage. This, of course, does not *regulate* the supply; it simply *reduces* it. Still, if the two tips be in such proportion that the lower will pass from 2 to 3 feet per hour, at a pressure of 10 to 15-10ths, and the upper of such width of opening that when the gas is being consumed the pressure between the two does not exceed 3 or 4-10ths, a very great improvement in illuminating power will be effected, as compared with burning the same quantity at high pressure. A very good result, for example, is got by connecting a No. 1 and a No. 6 Bray's burner by a small tube, and burning at about 14 or 15-10ths pressure.

There is, however, one class of consumers whose gas supply it will be the interest of every gas company or corporation to have under proper regulation and control—I refer to public lamps, the gas consumed in which is generally reckoned according to the number of hours a burner of a certain size may be lighted; but as excess of pressure means excess of consumption, it must be for the benefit of the company to see that the supply is maintained to each burner at a uniform rate; and if regulated to the proper pressure, and a suitable burner used, the improved light will not fail to be appreciated.

In concluding these remarks, I do not know that, in bringing this subject before your notice, I have been able to advance anything new, or any principle with which you are not already familiar; still, I think that, although much has been effected of late years in the way of improvement in the mode of consuming gas, each in his own sphere will still find ample room for extending the benefits to be derived from such improvements.

(*To be continued.*)

SALE OF LITTLEBOROUGH GAS COMPANY'S SHARES.—On Wednesday, the 24th ult., 500 shares of £10 each in the Littleborough Gas Company were sold by auction. By the terms of the creation of these shares, £1 10s. was to be paid on them by instalments of 10s. at the sale, and £1 (with premium) on the 21st of August; a further sum of £2 per share to be paid within three months afterwards; and the remaining £6 10s. to be called up as required. The shares were offered in lots of five each. The first lot fetched £6 5s. per share. The next five lots were sold at 2s. 6d. per share less than the first lot. Seven lots fetched £5 15s. per share, and eight £5 12s. 6d. per share. The two following sold at £5 10s. per share. There was a still further reduction in the next three, which sold at £5 7s. 6d. per share. Then the bidding began to increase again, and seven lots fetched £5 10s. per share. The next lot realized £5 12s. 6d. per share, and the next 15 were sold at the same price with one exception, where the highest bid was £5 10s. £5 12s. 6d. was maintained in the next four lots, and then the price went up £5 15s. in the next lot, followed by £5 12s. 6d. and then by £5 17s. 6d. Then the price fell to £5 15s. in seven lots, and rose to £5 17s. 6d. again in the next lot. The next bidding finished with £5 15s., at which 24 lots were sold. The next two rose to £6, followed by nine at £5 15s., and two at £5 17s. 6d. The bidding then rose again to £6, at which eleven lots were sold. The last two lots fetched £6 5s. per share, or the same price as the first lot, and the highest price reached. The lowest price was £5 7s. 6d.

BRITISH ASSOCIATION OF GAS MANAGERS.

(*Concluded from page 172.*)

WEDNESDAY, JUNE 19.

Mr. W. T. CARPENTER (Sheerness) read a paper on

IMPROVEMENTS IN CARBONIZING APPARATUS.

The subject of improvements in carbonizing is one that every gas engineer is more or less interested in; and although much has been said and written on the subject of mechanical stoking where machinery has been made to take the place of manual labour, I am not aware that a paper has been read touching upon any of the points relative to the apparatus hereafter to be explained.

It is not necessary that I should give a full description of all the retorts and ovens that have been designed and patented, used and in use, and the various processes for carbonizing coal for the manufacture of illuminating gas. Such a course would occupy too much time. I, therefore, intend only to treat upon those methods which may be necessary for reference. Many persons, besides gas managers, have been engaged on this subject, and have had fancies for novelties, upon which large sums have been spent in the construction of apparatus; to convert coals into illuminating gas, and likewise reduce the cost of production.

In the earliest days of gas manufacture, the attention of engineers was given to the importance of economy in the retort-house, with a view of reducing the heavy, hot, and exhaustive duties of the stokers engaged in drawing and charging the retorts. With this object, Clegg introduced his discharging and revolving web, on which the coals were made to pass through the retorts by means of a flat iron chain; and although it is recorded that excellent results were obtained both in quantity and quality of illuminating gas, the scheme was abandoned on account of the destructive nature of the hot coke on the iron chain. This system was continuous, and came very near to perfect carbonization.

A Mr. Hobbins, of Walsall, also patented a system of through retorts, where a series of rakes were used to level the coals, and push out the coke but, as with Clegg's revolving web, the heated coke destroyed the rakes, and not finding it so economical as was expected, it was abandoned.

We have it also recorded that Mr. Brunton, when Engineer of the Birmingham Gas-Works, had a discharging system of retorts, whereby the coals were thrust into the retort, the coke ultimately falling into a water cistern, from whence it was collected. The inventor had 50 retorts at work on this system at one time, and claimed an increase of 35 per cent. in volume, also a saving in labour. The important increase said to have been obtained by these pioneers in gas manufacture must not be too lightly passed over. Had these statements been made at the present time, with clay retorts worked at high heats and with improved exhausting machinery, the surprise would not be so great; but we may infer that, as iron retorts were used in both Clegg's and Brunton's systems, there are some reliable data for the inquiring gas engineer to work upon, and we have as recorded certain facts which lead us to believe that the last-named processes were only partial failures. We, therefore, find there is still room for improvement in the retort-house, for the stokers have yet to perform their duties. It is true, machines and improved stoking tools have been introduced and placed into the stokers hands, but the work of drawing and charging the retorts has still to be performed.

The advantage to be derived by the use of machinery is obvious, and, whether in gas-works or any other manufactory, its introduction is with a view of reducing the heavy labour and cost of production. How far this can be carried out in the retort-house is a matter yet to be solved, and it behoves the gas engineer to introduce machinery wherever it is practicable.

I have for many years directed my attention to the subject of improvements, and have constructed an apparatus which promises to go far towards reducing the heavy labour of the stoker, having the novelty of being nearly self-acting and continuous, having gravity for its principle, giving equal results with less labour, and accomplishing the most disagreeable part of a stoker's duty.

The apparatus consists of a double bench of retorts and oven combined, the retorts being open at the back end, and communicating with the oven into which the coke is discharged, and where, after remaining some time, it is allowed to fall out.

The engravings show a Front Elevation, Side Elevation, and Transverse Section of the apparatus. A is the hopper, into which the coals are placed; B is a pulley; C is a vertical shaft, with arms, to keep the coals from clogging; and D is a worm on the driving-shaft. E is the mouthpiece, and F F are wheels which give motion to the screws or regulators, X X. H H are the retorts, and I I are the openings pierced in the retorts for the exit of gas to ascension-pipe. J is the oven into which the coke is discharged; K is the main flue which heats the oven, and L and N are eduction-pipes for carrying off the gas. M is the coke outlet, into which is fitted a door, opening downwards.

The action of the apparatus is as follows:—Coals are placed in the hoppers, and descend into the mouthpiece, and falling on the screws are gradually pushed into the retort, becoming soft by means of the heat, and forming themselves into the shape of the retort. They thus completely fill the small end, and keep back the gas; and as the coals are screwed into the retort the charge assumes a shape, so as to half fill the interior area, the gas finding its escape by the outlet, I. The motion is continuous, and the charge reaching the end of the retort becomes coke of a fragile nature, falls into the oven, where any gas remaining in it is driven off, and escapes from the top of the oven by the pipe, L. After the coke has remained in the oven some time, it is allowed to fall out, by opening the door for that purpose. The door is then immediately closed in readiness for the next charge.

The apparatus having been practically at work at different times, opportunity occurred for testing its merits. The trials were conducted in the following manner:—All other retorts were struck and drawn, and the valves shut, the index of the station-meter taken, and the hoppers filled with coals. When the apparatus had been at work for the time appointed, the index of the station-meter was again taken, coals weighed to refill the hoppers, and the coke discharged and carefully measured.

Trial No. 1.—Time eight hours, exhauster worked at 3-10ths pressure in retorts, the hydraulic dip dispensed with, and bye-pass in use. Coals carbonized, 12 cwt.; gas registered, 6210 cubic feet, or 10,350 cubic feet per ton; coke discharged, 21 bushels; illuminating power, 13½ candles. When this trial took place the apparatus had been at work 29 days.

Trial No. 2.—Time eight hours, exhauster worked at 2-10ths pressure in the retorts. Coals carbonized, 9½ cwt.; gas registered, 5200 cubic feet, or 10,947 cubic feet per ton; coke discharged, 18 bushels; illuminating power, 14 candles.

Pelaw Main coal was the description used.

There is a speciality in connection with this apparatus, to which I beg to call your attention—viz., the principle on which it is constructed—that is, gravity; for on the coals being once placed in the hoppers, which can be done by means of a Jacob's ladder or elevator at a trifling cost, they are kept continually moving until they reach the oven. This moving causes the gas to escape from the interior of the charge, greatly facilitating the carbonization of the coals.

It is not necessary to crush the coals, as this must be regulated by the pitch of the screw. For instance, a 4-inch pitch will take a piece of coal the same size, and in well-regulated gas-works no larger pieces should be used in any process. Should it happen that a larger piece finds its way to the screw, it will get crushed by it as it revolves, or it slips the screw out of action. This circumstance will be seen by the man in charge, but it seldom happens, and is soon remedied.

Again, the manufacture of coal gas, under any process, deposits a layer of carbon in the retorts, and to remove this carbon is generally a difficult task, and not a few retorts are injured and destroyed by the process. If not injured by the chipping bars, the retorts are allowed to stand open, exposed to the atmosphere for several days, in order to burn it off. Should it be necessary to clean the carbon off in this setting, the front plugs are taken out of the mouthpieces, and the charge pushed down into the oven and discharged; the door is then left open, when a strong upward current of air passes through each retort, and the carbon is effectually removed in a few hours.

I have simply stated these facts, to elucidate, if possible, the advantages of the system.

In conclusion, I may state that the apparatus is erected at the end of the retort-house—a great distance from the engine—motion being transmitted by means of ordinary chains and pulleys. Very little power is required to work the setting.

To better illustrate the system, there is a model, and a screw which has been used during the time the setting has been in action, both of which you may inspect, also a sample of coke.

[The discussion which follows has reference to the paper by Mr. G. E. Stevenson, on "Some Notes on the Construction of Retort-Settings," published in last week's JOURNAL, as well as to the above paper.]

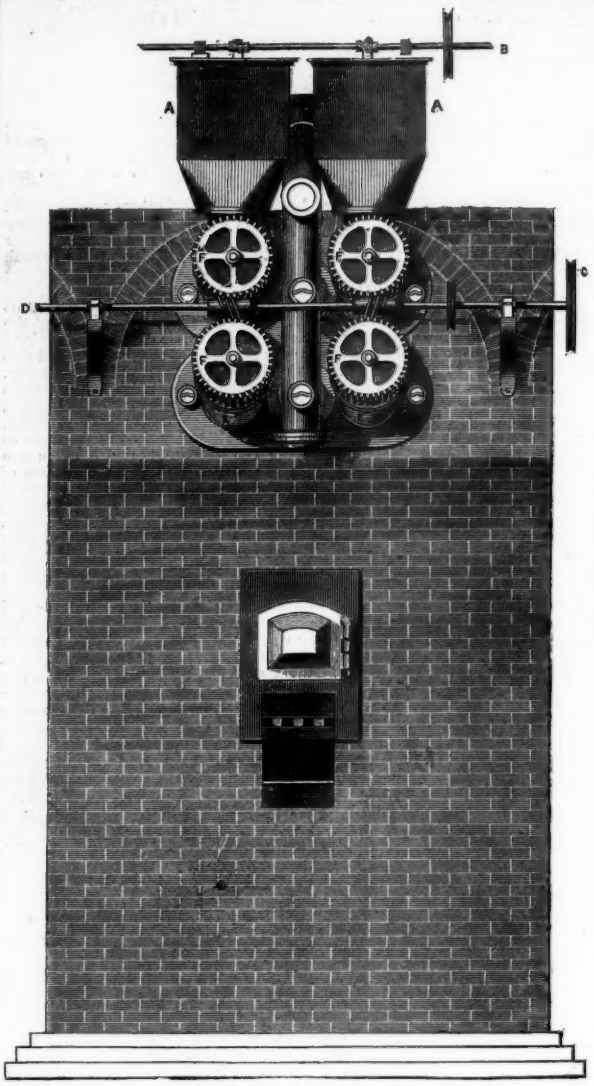
Mr. BARRATT (Grantham) said there were several questions required to be asked with regard to Mr. Stevenson's setting. This was the very life of their system. They either lived by a proper application of their retorts, or died by the abuse of them; and it was essentially necessary to ascertain whether there was any advantage in this method or not. He thought a great deal would depend on the quality of the coal used; and their Scotch brethren had an advantage here, because they had a better quality of coke from the north country coal, which would evolve a greater quantity of heat than any other coal. If these retorts could be set in such a way that they would last for a considerable time with a minimum quantity of coal per ton carbonized, they would be in a position to judge of the benefit of the system, and no one could confer more benefit on the Association than by bringing out the best system of setting retorts.

Mr. GORE believed that every disease required its own remedy; and so every class of coal would require a special system of treatment; as the system which was perfectly applicable to one class might be perfectly inapplicable to another. He thought it was from this fact that they had such conflicting statements made as to the results obtained. It was quite certain that all the coal-fields of England produced coal which might manufacture light-giving gas; but the quantity of it would vary, to a great extent depending on the position of the stratification of coal and the source from which it was obtained. Suppose they had a retort-setting of that class, and had to deal with some of the cannel coals of Scotland, the necessary consequence would be that, instead of getting from 10,000 to 11,000 feet per ton, which a Scotch manager would expect to get, he would probably get no more than 7000 or 8000 feet, simply because the amount of heat necessary to evolve the gas from its cells in the coal was not supplied rapidly enough. Again, they might be in a district where the gas was the product most required, and where they could afford to expend an extra bushel or two of coke with advantage. It was quite certain that a furnace which would consume a large quantity of coke, and give out a greater quantity of heat in a given time, was more applicable to such a district than one with slower combustion, less product of heat, and, consequently, a smaller result during that given time. In judging, therefore, the value of any system of retort-setting, they must be guided by a variety of circumstances, and thus the engineers of each locality must select for themselves. He was satisfied that if they would deal with this matter on a different footing from what they had hitherto done—if they abondoned, to a certain extent, the "follow-my-leader" principle in using any system, and were only guided by the lessons it taught, they would gain great advantage. Mr. Carpenter had read a most valuable paper on continuous carbonization, and there were circumstances where such a system might be of inestimable value. It seemed that the coke produced from such a system would be of little value; but there might be places where coke was only of secondary importance, and the light evolved of great importance. So that the two systems, although diametrically opposite to each other, would have advantages which were well worthy of attention.

Mr. WEST (Maidstone) desired to thank Mr. Carpenter for the long time and attention he had given to this subject. He had spent a great deal of time in working out what he thought would be the most perfect system of carbonization, and he was not in a position to say it was not so, for though he was to some extent opposed to him, still he thought he was on the right tack. Whatever invention was brought forward, the most important work of a gas manager was that of carbonizing coal in the retort. Mr. Carpenter had spent a great deal of time and money on this matter, and anything he had said was worthy of great consideration. He referred to the pressure on the retorts, and that was a very important principle. In many London and large provincial works they worked with a vacuum, and he thought the right principle was to keep the pressure in the retorts as light as possible, say an eighth or a quarter of an inch. The question of retort-setting was no doubt an important one, and bore on the manufacture of retorts. Some men might have retorts which would not last half the time that they did with others. How was that? Because one might work with a vacuum and the other with pressure. If one worked under the least possible pressure he thereby not only got the volume of gas from the coal, but the full illuminating power. With regard to Mr. Carpenter's apparatus, the questions of cost and wear and tear would arise. No doubt the best retorts were often put into arches and destroyed in a short time, and the manufacturer was sometimes blamed, when in all probability he did not deserve it. He held that they should work under pressure, and see that the furnaces were properly kept up, and then no doubt, as a rule, they would get more gas and a higher illuminating power.

Mr. STEVENSON said he was pleased that the remarks which had been made were of a nature to widen the field and call for considerable attention. He desired to express his great pleasure at hearing of the new method brought forward by Mr. Carpenter, which he believed was a thoroughly good thing. It reminded him of the invention of Messrs. Porter and Lane, who proposed to carbonize coal in retorts by means of a screw. They set their retorts vertically, and experiments were made at the Horseferry Road station; but there they failed, because the screw, which was of cast iron, in several pieces, would not stand the heat. Apart from that, the principle was sound and the idea good. In Mr. Carpenter's arrangement that evil was remedied.

Mr. WILSON said a few years ago he patented an invention very much the same.

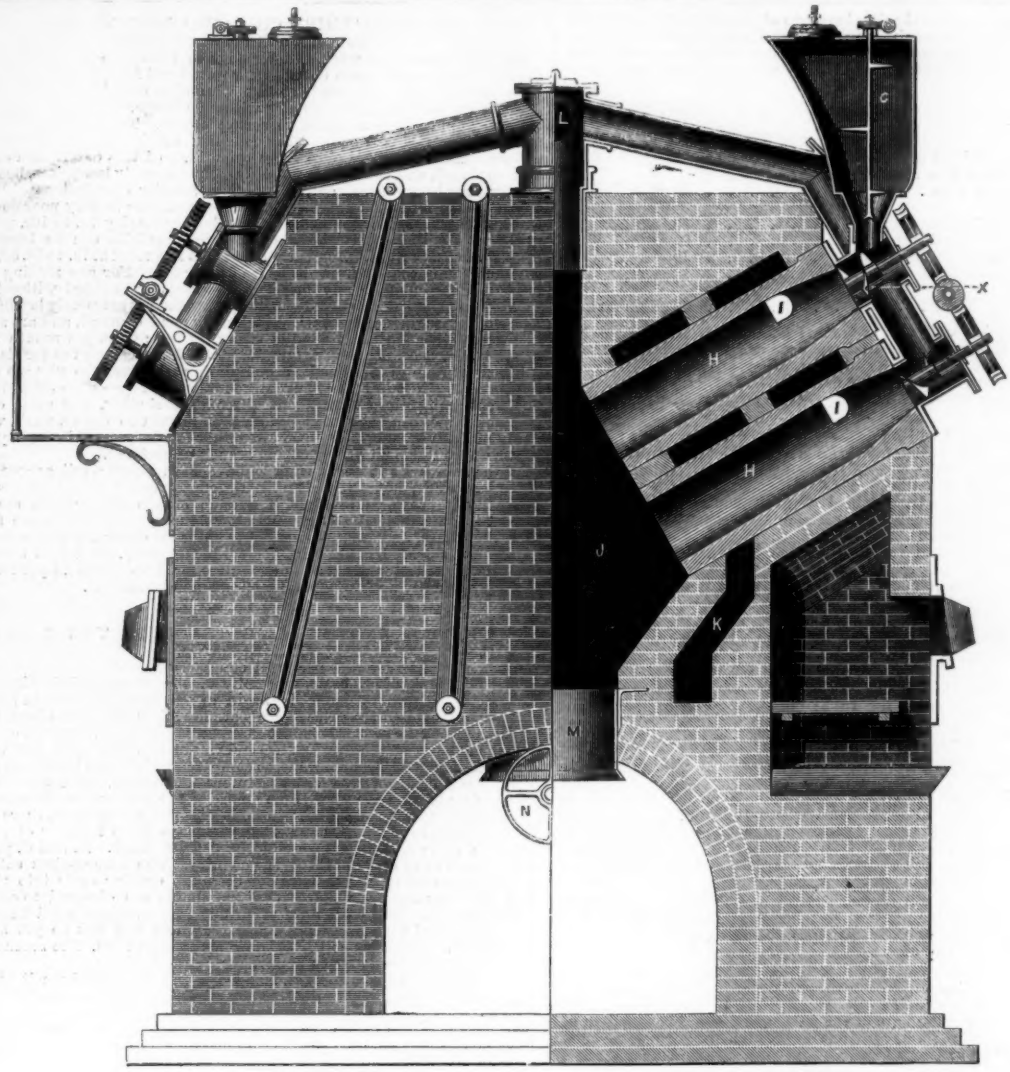


FRONT ELEVATION.

Mr. STEVENSON said with regard to his own paper, the first speaker referred to the seven retorts as not being so good an arrangement as the six, and as far as the combustion of fuel was concerned, and the dropping out of the retort, he quite agreed with him. For many reasons he preferred the setting of six, but his settings were arranged for seven before, and he thought his best plan was to do what he could with the seven. There was economy of space in this plan, and the middle retort did not in this system, to any appreciable extent, diminish the heat of the others. He had not attempted to introduce atmospheric air above the furnace doors to consume the carbonic oxide that might be formed, but relied entirely on the air spaces in the furnace, and he believed that no carbonic oxide left it unconsumed in any form. The draft was not great, and there was plenty of time for the gases to be converted into carbonic acid. With regard to the class of coal used, no doubt different coals gave different results; but he could not understand what Mr. Gore said about his setting not being able to carbonize Scotch coals. He was not acquainted with Scotch coals other than the Scotch cannels; but in ordinary settings they could carbonize cannels as well as ordinary coal, and it was continuously so used. His aim had been to get a higher heat, not to reduce it; for he did not think it possible to go to too high a heat, having regard to the illuminating power of the gas. It might be a question whether it was desirable to use cannel to get a certain illuminating power; but the better and quicker it did it, the more economical it was. He used Silkstone coal, but he believed the setting would give equally good results with Newcastle. With regard to the pressure, he used an ordinary dip-pipe set to 1½ inches. He drew 1 inch vacuum, so that there was half an inch pressure in the retorts; and as the connections and main were of ample size, he did not think that the pressure was any more than that shown on the gauges.

Mr. CARPENTER, in reply, said there was no opposition between him and Mr. West. If that gentleman would only employ a steam-engine to work his apparatus, instead of manual labour, no better system could be produced. He believed the apparatus he had described could be erected for £25 per mouthpiece from the foundation to the top. Of course, the elevator or lifting apparatus would do for a whole retort-house. With reference to Mr. Gore's remarks about a continuous pressure, so well experienced, as he was, he knew well the different systems, and it would be useless for him to expatiate with advantage on the saving of labour if they could be carried out. If the drawing and charging could be done away with, the saving in labour would be about 40 per cent. He had seen results from gas-works capable of making 60 to 70 million cubic feet per year, and he believed that his system, or one like it, whether carried out by himself or any one else, would be a great benefit to the gas manufacturer, simply because the work of the stoker was a degrading duty.

The PRESIDENT said they would all feel that Mr. Stevenson's paper was an admirable one, being an effort to bring into system, the observations of a careful observant man. If they could get something more in the shape of definite data to guide them in the apportionment of their apparatus



SIDE ELEVATION. TRANSVERSE SECTION.

throughout, it would be a very great help, and save every man watching and determining for himself the proportion of the different parts of gas-works. One object of the Association should be to bring together the observations of each man, so as to bring to something like system the apportionment of apparatus, and other matters of the same sort. As to Mr. Carpenter, of course he would simply say that it had nothing whatever to do with processes that might have been patented or invented in times gone by. He was perfectly sure that he had been labouring throughout on an idea which had occurred to him as an original idea, and the paper was eminently creditable to him.

Mr. S. LEONI (London) read the last paper, entitled

HOW CAN GAS BE MADE POPULAR AS A FUEL FOR COOKING?

I hope I shall not be thought guilty of presumption in placing this question before your meeting, my object being to raise a discussion which may result in the adoption of the best mode to benefit gas consumers as well as proprietors of gas-works, the interests of both being identical. The latter, no doubt, are sufficiently convinced that an increasing consumption of gas during the day, for cooking and other household purposes, would add to their sources of income. Consumers, however, require different inducements before adopting our suggestions, their objections to gas as a fuel being several, and some of them well founded.

1. Gas itself is comparatively in its youth. Some of you, no doubt, will remember the time when many of our towns were lit by oil, and we all know how conservative people are, especially the money-spending classes.

2. Those even who have tried the experiment of cooking by gas may have been disappointed as to the results.

3. Others, again, found the cost of a good gas kitchener too much for their means.

4. Some, however, who did not entertain these objections, were disappointed through the insufficiency of the gas supply when they most needed it.

5. The majority of consumers, being simply tenants and not owners of their houses, have naturally a strong dislike to lay out money on appliances, and especially fittings, which they consider should be provided by the landlord. They would, however, I believe, willingly hire a good kitchener in the same way as they now rent a gas-meter.

I will endeavour to place before you a few suggestions to overcome some of the objections referred to, and which I hope will meet with your approbation.

Gas being now comparatively cheap, and gas-stoves better than they were, some people (always in favour of progress) are already appreciating the advantages of gas as a fuel, and have thus prepared the ground for an increased movement in the same direction. The prejudice, therefore, is fast diminishing; the real objection is the one of the majority who, as tenants, would be willing to pay £1 or £2 a quarter for gas for cooking, in addition to their present outlay for lights, considering such an amount reasonable in lieu of a coal bill, or part of it, the saving of firewood, the absence of dirt, smoke, soot, &c., and the economy of labour, especially during the summer; but these tenants cannot afford to buy a kitchener, or do not care to do so. Gas proprietors, or corporations owning gas-works have, therefore, the remedy in their own hands, by providing kitcheners at reasonable rental, and by maintaining a good average pressure during the daytime.

I should like to see proprietors follow the example already set by such pioneers as the Crystal Palace District, the Maidstone, Hastings, and other Companies and Corporations, and who, I understand, are satisfied with the results of what they have initiated, and for which great credit is due to them.

A good substantial kitchener, fit to do all the work in an 8 or 10-roomed house, or to be used as an accessory in a larger establishment, may be hired out advantageously at the low rent of about 2s. 6d. per quarter. Besides boiling, stewing, frying, &c., the kitchener should roast and bake to perfection at a reasonable expenditure of gas; it must be simple in construction, and stand wear and tear for years without getting out of order; must also be easily cleaned, and be capable, when required, of being sent out fresh and ready from one consumer to another. The oven should be lined with heat reflector tiles made of fire-clay or other non-conducting material, and should be fitted with atmospheric gas; the required temperature is then readily obtained with a consumption of about 20 cubic feet per hour, and can be maintained with less.

The inside lining being, as described, a bad conductor of heat, there is scarcely any waste of calorific power, and the heat is uniform, which is a great desideratum for roasting and baking. The joints of meat when cooked have very much the same appearance as those done before an open fire; but they lose rather less in weight, are plump and full of gravy, they require neither turning nor basting, and can be left without any attention whatever during the time required for roasting, which is regulated according to the weight. The kitchener, as described, may be used with great advantage by a family of from six to twelve persons, and, with a little manipulation, will turn out a capital dinner for twenty.

It is, however, important that the kitchener should not offer too many facilities, which may result in big gas bill, as I find, in practice, the production of hot water by gas to be the most extravagant feature in a kitchen. Whether a self-feeding boiler or one fed by hand is used, or one forming the jacket of the oven either at the top or sides or back, the waste of gas is generally the same—servants, and sometimes even the mistress herself, will keep the gas burning all day, and allow the water to steam away.

Whilst the daily meals for a middle-class family can be cooked with from 80 to 100 cubic feet of gas, the hot water will require quite as large an expenditure if a boiler is in use. The only remedy against such extravagance is to make servants fill kettles or pans with water, and set them to boil over the burners of the hot-plate. The trouble of filling such utensils, and the exposed position of the burners under them, have the desired effect in causing the gas to be at once turned off when the water

has boiled. A boiler has also the disadvantage of furring inside and coating with soot outside; so that the heat has to penetrate through both of these deposits, at a considerable waste of power. From the same causes the boiler is subject to constant damages, and will require repairs from time to time.

The following is an average consumption for the daily meals for a family of eight persons:—

Breakfast—		
Consisting of tea or coffee, ham and eggs, or chops, and also toast, including hot water for washing up	20	cubic feet.
Dinner—		
Six-pound joint and pie	30	,,
Soup, fish, vegetables, potatoes	20	,,
Hot water for washing up	10	,,
Ditto for tea, &c.	10	,,
Total	90	cubic feet.

Another consideration which can scarcely be too much appreciated by the consumers, is the independence they gain with reference to their cooks and servants in general by the adoption of gas-stoves, which enable ladies and their children to do their own work with the greatest of ease, and, in many cases known to me, the services of a cook are dispensed with altogether.

As to the consumption, I will quote here from my own gas bills paid to the Brentford Gas Company. My family is six in number, with the addition of occasional visitors to dinner, &c. No coals are used in the kitchen, and therefore all the cooking and the supply of hot water, including three or four baths per week, has to be provided by gas. The last four quarters (at the rate of 4s. per 1000 cubic feet) amounted to £4 9s. 8d. for the kitchener and bath boiler, and £4 13s. 3d. for the lights. Taking this to be a fair average, the rental for 1000 householders would amount to £4483 6s. 8d. for the kitchen per year, and £4662 10s. for lights, representing, therefore, an increase of nearly 50 per cent. due to the additional use of gas for fuel.

With such a result before them, proprietors of gas-works have every interest to induce consumers to use gas as fuel, by inviting them to hire the necessary appliances, or to purchase them by instalments. We must, however, not overlook the important question of pressure, which should not be less than 8-10ths of an inch close to the meter, especially in large establishments where one meal has to be cooked for 500, 1000, or more persons.

Gas kitcheners are now constantly used in many of the national schools of cookery, and the teachers recommend them to the ladies attending their classes.

A step in the right direction to overcome inveterate prejudices would be the organization of periodical exhibitions, where the public would have the opportunity of hearing practical lectures on the subject, accompanied by ocular demonstration. Such an exhibition has just been held, with great success, in the Town Hall of Birmingham, initiated and carried out by the Birmingham Corporation Gas Committee.

With your permission, I will now explain the working of a few small new appliances, adapted for offices, workshops, artizans families, and also for the use of ladies—my object being to show you what can be done with 10, 20, and 30 cubic feet of gas.

The smallest quantity (10 feet) will roast 2 lbs. of meat and steam 4 lbs. of potatoes. With 20 cubic feet, we can roast 4 lbs. of meat and steam 8 lbs. of potatoes. Again, with 30 cubic feet, we can roast 4 lbs. of meat, steam 8 lbs. of potatoes, also a pudding, boil vegetables, and supply one gallon of hot water for washing up; and also one quart of boiling water for tea. This is sufficient for an artizan's family. The cooker, intended for a lady's special use, will roast 4 lbs. of meat, bake two pies, steam 5 lbs. of potatoes, and supply 3 gallons of boiling water for washing up; the whole with 30 cubic feet of gas, in two hours time. With an additional consumption of 10 cubic feet of gas, the hot-plate can be used for soup, fish, or *entrées*; in fact, this kitchener is sufficient to cook a dinner for eight persons.

I avail myself of this opportunity to mention a few facts known to me through personal experience, with reference to cooking by gas on a large scale, and where the advantages are so great and manifold that the difficulties of prejudice and even expense have been considerably reduced.

At the London Hospital they cook daily for 800 inmates, at an expense of 7s. for gas; three persons only being employed to do the cooking and kitchen work. Their apparatus has now been in use for eight years, has only been repaired once, and this after seven years of constant work. From a register carefully kept during the whole of this period, the authorities are enabled to certify that the waste in meat has been materially reduced by this system. In short, they save over £500 a year in meat alone, not taking into consideration the other advantages.

At Mr. Whiteley's, Westbourne Grove, 600 to 700 lbs. of meat are roasted daily, at an expense of 5s. 3d.; and 200 gallons of water are boiled for tea at a cost of 10d. Many of the best-known hospitals, infirmaries, unions, and asylums now use gas for cooking, and amongst these are Guy's, Lambeth, St. Saviour's, Poplar, and Stepney, with a total of above 3000 inmates. Doubtless a number of other similar places known to members of this Association have also adopted gas for cooking purposes. Messrs. Bertram and Roberts, Spiers and Pond, and other large refreshment contractors, also large hotels and West-end clubs, use gas in preference to other fuel, because they find it more efficient and cheaper than coals, to say nothing of the economy of time and labour. Large warehouses here, in town and in the country, are also using gas, and the same may be said of many public schools. I could even mention some private establishments, the owners of which spend princely incomes, and who use gas for cooking in preference to other fuel.

I have avoided the subject of heating apartments by gas, for the simple reason that it cannot be done so effectively and cheaply by this means as by coals. A good coal fire is more cheerful and comfortable than any gas fire, and, in a fire-grate properly constructed, does all the required ventilation. If coals are superseded by an asbestos fire, the expense would be quite double as much, without obtaining such good results. There are many instance where a small gas fire or calorifere are preferable, sometimes for want of a fire-place, and sometimes when the warming is only needed for a few hours during the day. In such cases the consumer will find out for himself the most suitable stove, and therefore he had better be left to his own resources.

In conclusion, I am happy in feeling that the facts and figures proving the great importance of the subject, and the general information I have been allowed to put before this meeting, will justify and induce managers to use their influence with their proprietors to take into consideration the steps I have suggested to make popular and promote the use of gas as a fuel for cooking.

The PRESIDENT said he very much regretted that time did not allow of giving this practical paper the discussion they would like.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

As I announced last week, there has been a reduction this month in the Manchester district in the list rates for round coal for house fire purposes, both to merchants and private consumers, and in other districts, although the list quotations are nominally without change, prices are weak, and very low figures are accepted to secure orders. The business doing in round coal suitable for gas-making purposes continues in a very unsatisfactory condition. There are large quantities of this description of fuel still unplaced, and consumers not only offer extremely low prices, but they ask for very long forward deliveries. The inferior descriptions of round coal, suitable for steam and forge purposes, continue in very poor demand and low in price. For the best classes of Wigan Arley 9s. to 10s. per ton at the pit mouth is still asked, but common qualities can be bought at from 7s. to 8s. per ton. Pemberton four-feet is quoted at 7s. to 7s. 6d., and common round coal at from 5s. 6d. to 6s. per ton. For gas making coals it is difficult to quote any price, as contracts are settled without any reference to the list rates, and generally are taken at extremely low figures. Engine classes of fuel meet with a tolerably good demand, and are steady in price, with good slack a trifle stiffer, prices at the pit mouth being about 4s. 6d. to 5s. per ton for burgy, and 3s. 6d. to 4s. per ton for slack.

Stocks of round coal are still accumulating wherever the pits are working anything like full time, but in the majority of cases the collieries are not kept going more than about three days a week, and some of the common mines are not running more than about two days a week, whilst many of them have been stopped altogether for the present in consequence of the unprofitable character of this branch of business.

In the iron trade there appears to have been rather a lull as compared with last week, but there is still a general belief that business will gradually improve, and although outside brands of pig iron are still offered in this district at extremely low figures, local makers are firmer than they were, and are not disposed to enter into long forward contracts at present rates. Finished iron is without change, local bars delivered into the Manchester district being still offered at about £6 per ton, but there is generally a more hopeful feeling amongst makers.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The shipments of gas coals, especially of the better qualities, improved last week. Gas-works generally begin to add to their stocks in August; and, as freights and the price of coals are low, the shipments of coals from the Tyne Dock show 3000 chaldrons of coals shipped last week over the average exports of the first and second weeks in July. The last weekly shipments were 30,000 chaldrons, as compared with 27,000 chaldrons in the week mentioned. Prices are absolutely unchanged. The demand for best gas coals is an average. Some more of the Durham second-class pits are being closed. At Brandon, where, in the prosperous times, there was a population of between 3000 and 4000 persons, a large number of pitmen and lads and coke-burners were discharged last week. A. and C. pits are laid in, and so in other parts of the country. The second-class collieries generally are doing badly. Some of them are putting coals into market and accepting any price almost that merchants are disposed to offer the colliery offices. There are no signs of any improvement until there is a revival of local manufacturing industry, which will not be yet awhile, apparently. Best steam collieries work fair average time. The second-class steam collieries are doing no better.

The coasting freight market, last week, was exactly where it was the week before. It was neither better nor worse. 4s. per ton remained as the freight to London, for steamers, and not more than 5s. a ton could be had by sailing vessels to discharge gas coals at the wharves in the Thames. Steamers have loaded some more cargoes of gas coals in the Tyne at low rates of freights for Ireland. Shipping business for the Mediterranean and the Baltic is extremely dull. Freights are low, and steamers experience much difficulty in finding profitable employment.

The chemical market was a trifle firmer last week. Prices advanced a little. A fair quantity of fire-clay goods are being shipped. The iron trade is rather firmer, though there does not seem to be much improvement in prices.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Friday week the annual meeting of the Cullen Gas Company was held. The Directors recommended the usual dividend of 5 per cent.; but as there was strong feeling that the debt of the Company should be paid off before declaring any dividend, a counter-motion was brought forward limiting the dividend to 2½ per cent. This was carried by a large majority; and in opposition to the recommendation made by the Directors that there should be no change in the price of the gas, it was resolved, also by a large majority, that the price should be reduced from 8s. 9d. to 8s. 4d. per 1000 feet.

The annual meeting of the Carluke Gas Company was held last Thursday. From the report it was shown that various important repairs and improvements had been effected in the gas-works during the past year, which were devised and superintended by Mr. Levi Monk, of Lanark Gas-Works. A statement of the income and expenditure was also read, which showed the Company's affairs to be in a prosperous state. The usual dividend was declared.

A meeting of the Peterhead Town Council was held last Thursday, when a report from a Committee was submitted, which stated that the negotiations for the acquisition of the Gas Company's works were making satisfactory progress. The arbiters appointed to value the works, plant, &c., are Mr. M'Crae, of Dundee, for the Gas Company, and Mr. Smith, of Aberdeen, for the Town Council, with power to appoint an oversman.

The Wishaw Burgh Commissioners, at a meeting held last Thursday, were informed by the Clerk that all the legal formalities connected with the adoption of the Gas Act had been complied with, and approved of by the Sheriff, and that the Commissioners were now in a position to proceed with the necessary negotiations for the transfer of the works of the Gas Company to the Town Authorities.

Operations have now been completed by the Dunfermline Gas Company for extending the gas supply to Townhill, an important manufacturing and mining village which is within the burgh boundaries. It was intended to make use of the gas for the first time last Saturday evening. In the course of the ensuing winter it is expected that a great demand will be made on the resources of the Gas Company.

The Directors of the Crieff Gas Company have reduced the price of gas from 7s. 6d. to 6s. 8d. per 1000 feet.

At the usual monthly meeting of the Glasgow Town Council, held last Thursday, the ninth annual report of the Gas Committee was submitted. It was a very interesting and valuable document. During the year, extending from June 1, 1877, till May 31, 1878, there had been a gross revenue of £327,492 19s. 7d., and an expenditure (including £18,350 written off capital for depreciation for the year) amounting to £267,618 1s. 10d., leaving a balance of £59,811 17s. 9d., which, including £46,586 6s. of surplus

profits of previous year, made the total balance £106,848. Out of that sum, payments were made on annuities on stock, and interest on borrowed money, amounting to £60,098; and deducting other £5912 paid to the sinking-fund, there remained a balance of £40,837 to be carried to next year's account. During the year there had been made repairs and renewals, the cost of which amounted to about £10,000, all of which was paid out of revenue. The quantity of gas sold during the past year was 1,481,329,000 cubic feet, or rather less than the quantity sold in the preceding year. On the recommendation of the Committee, it was resolved to continue the price of gas at 4s. per 1000 cubic feet, and it was agreed to leave the accounts on the table for a month.

The members of the Hamilton Town Council are still at "sixes and sevens" on the subject of the proposed extension and alteration of the gas-works. At a meeting held last Thursday a report from the Gas Committee was submitted, which showed a reversion to profit of £1323 1s. 10d. for the year ending March 14, 1878, and they recommended that from that date the price of gas to consumers should be reduced from 4s. 2d. to 3s. 9d. per 1000 feet, and also that a sinking-fund be commenced by a deposit of £500, with an annual payment of 2½ per cent. on capital account. The Committee went on to state that, after considering a report from the Manager (Mr. Johnstone), they recommended that Messrs. Aitken and Young's analyzer be dispensed with, and that intimation be given for its removal. A long discussion ensued as to the need for spending about £5000 on works which, according to the late convener of the Gas Committee (Mr. Tanish), are constructed on the very best principles, and have given results unequalled by any other works in the West of Scotland, as testified by practical men. An expenditure of £500 would, he considered, be quite sufficient to make the works serve for many years. It was eventually resolved to delay consideration of the matter till Wednesday, when it was arranged that Mr. Barr, the Consulting Engineer, should be in attendance.

It appears that affairs are not very satisfactory in the Dumfries Corporation Gas Committee since the adoption of the Burghs Gas Supply (Scotland) Act in that town. From the report of the proceedings of the Gas Commission held last Thursday, it seems that the works were not going on as well as the Committee wished, and they therefore resolved to invite Mr. M'Crae, of Dundee, to inspect the whole system at the gas-works. The Clerk wrote to Mr. M'Crae to that effect, and that gentleman recommended that Mr. Malam, the Manager, should make a weekly report, which should be remitted to him for consideration. Much displeasure was expressed at Thursday's meeting that the reply was not sent officially through the Clerk, but to Bailie Wood, the convener of the Gas Committee. That gentleman, in the course of this discussion, said that matters were so unsatisfactory that it was considered advisable to consult Mr. M'Crae, and that the letter from that gentleman contained certain information as to furnishing weekly reports. Mr. M'Crae had written on the distinct understanding that the communication was not to be made public. However, matters had since assumed a very healthful aspect, and the yield of gas per ton was advancing to something like what it should be. After the discussion had gone on some time, the Commissioners sat in private as a Gas Committee to consider the correspondence which had taken place, particularly the letter from Mr. M'Crae to Bailie Wood.

Last week's Glasgow pig iron market was again quiet, with a moderate amount of business done in warrants. The price ranged from 50s. 1d. cash, and 50s. 2½d. one month, on Monday, to 49s. 10½d. prompt cash on Friday, at which the week's business closed. Shipments are on a very small scale, and compare most unfavourably with those of last year. The stock in the public warrant store was increased during the week to the extent of 2096 tons. Manufactured iron is in better demand, and in some cases an advance of 2s. 6d. per ton on plates and angle iron has been established.

The coal market remains without change. There is no demand of any consequence, either for the local or the shipping trade, and the position of the market is one of unmitigated dulness. The following are the current quotations in the Glasgow market for gas coals:—Lesmahagow, 30s. 6d. per ton, f.o.b. Glasgow or Grangemouth; Kinneil, 25s. 6d. f.o.b. Leith, 22s. 6d. Bo'ness; Haywood, 25s f.o.b. Granton, 26s. Leith, 27s. 6d. Grangemouth; C. D. Lesmahagow, 15s. 3d. f.o.b. Grangemouth, Leith, and Greenock; Longlee, 17s. f.o.b. Leith, 16s. Glasgow; Niddrie No. 1, 24s. f.o.b. Leith; Drumpark, 11s. 6d. f.o.b. Leith, 11s. Glasgow; Bank coal, 17s. 6d. f.o.b. Leith, 13s. 6d. Ayr.

Malvern Link Gas Company.—The thirty-third half-yearly meeting was held last Thursday—Mr. T. Holland in the chair. From the statement of accounts, it appeared that a profit of £207 12s. had been made on last half year's working, added to which there was in hand, from the previous half year, a balance of £25 11s. 7d., making a total amount divisible amongst the Shareholders of £233 3s. 7d. A dividend of 7 per cent., which would absorb £210, and leave a balance of £23 3s. 7d. to carry forward to the next half year's account was declared.

Wisbech Gas Company.—The annual meeting was held last Tuesday—Mr. G. Dawbarn presiding. The report of the Directors spoke of the continued prosperity of the undertaking, and the probability of making arrangements during the ensuing year, in relation to the contemplated improvement and enlargement of the works. The report and accounts were adopted, and a resolution was agreed to, approving of the payment of a dividend of 10 per cent. The retiring Directors, Messrs. G. Dawbarn, R. Dawbarn, Anderson, and Payne were re-elected. Mr. Batterham was appointed auditor; and a vote of thanks was passed to Mr. R. W. Dawbarn, the Treasurer.

Sale of Gas Shares at Croydon.—On Thursday, the 25th ult., 408 shares in the Croydon Commercial Gas and Coke Company were sold by auction in 81 lots. The sliding scale is incorporated with the Company's last Act of Parliament, and though they were nominally 10 and 7 per cent. shares, the last dividends paid were 11½ and 8½ per cent. respectively. Lots 1 to 6, each consisting of five 10 per cent. £5 shares (fully paid), sold at the rate of £11 12s. 6d. per share; lots 7 to 21, at £11 17s. 6d.; lots 22 to 24, at £11 15s.; and lots 25 and 26, at £12. The 7 per cent. £5 fully paid shares were next sold; 36 of the lots of five shares each sold at the rate of £8 10s. per share; 18 at £8 12s. 6d.; while the remaining lot of eight shares realized a similar price.

Liverpool Water Supply.—At the recent meeting, at Liverpool, of the Association of Municipal and Sanitary Engineers, a visit was paid to the Bootle well and the new bore-hole of the Corporation. The party were escorted by the President of the Association (Mr. G. F. Deacon, the Borough and Water Engineer of the town) and by Mr. J. Parry. The President explained that about two-thirds of the water supplied to the town was brought by gravitation from reservoirs at Rivington, 25 miles distant, the remaining one-third being obtained from wells in the new red sandstone. Before any works had been constructed for the purpose of supplying Liverpool from Bootle, the water rose at the site of the present Bootle well, and flowed over the surface in a copious stream to the river, giving motive power to a paper mill on its way. Towards the end of the eighteenth century, Sir Clive Moore, Bart., projected a scheme by which it was proposed to bring the water of this spring by gravitation to Liverpool. An Act of Parliament authorizing the works was obtained, and an aqueduct, partly built and partly cut out of the sandstone rock, was constructed. The promoters, however, had evidently a very imperfect knowledge of the permeability of the rock, and, naturally, on letting the water into the conduit, it was rapidly absorbed, and flowed through the interstices of the rock to lower levels. The scheme was, therefore, a failure. Pumps and engines were subsequently erected, and the water was drawn from surface reservoirs excavated in the rock. In the course of time, as pumping was continued, the level of the water fell, and, in order to reach it, it became necessary to sink deep shafts, and erect new engines and pumps. A heading or underground reservoir, the lowest floor of which was 105 feet below the surface, connected the different shafts. The length of this heading was about 440 feet, the breadth 18 feet, and the height 26 feet. There were several bore-holes in it, the deepest of which was about 630 feet from the surface. When the present normal yield of the well, about 1,500,000 gallons per day, was pumped, the water which once flowed over the surface stood in the heading at a depth of 97 feet 8 inches from the surface, or 43 feet below the mean sea level. Last year the sinking of a new bore-hole was commenced from the surface close to the above-mentioned heading. The promoters of this scheme anticipated that an additional supply of 1,428,571 gallons a day, or 10 million gallons a week, would be thus obtained, and that the water supplying the upper well might be separated from that supplying the deep bore-hole, by means of a water-tight joint between the rock and the tubing up which the water rises. The bore-hole, 26 inches in diameter, had already been sunk to the depth of 960 feet. The depth to which it was intended to be sunk was 1000 feet. The apparatus used in boring was a modern application of the old Chinese rope boring-machine. The party were joined at Bootle by Alderman Rigby, Mr. J. H. Wilson (the Chairman of the Water Committee), Mr. T. B. Royden, and Mr. J. Barkley Smith. The greater part of the visitors descended the heading, which was illuminated by the electric light, worked by an engine at the top. The company also witnessed the mode of cutting the new bore-hole adjoining, and the ingenious process of pumping up the refuse and dirty water, the various particulars connected with which were lucidly explained by Mr. Deacon.

West Houghton Water Supply.—The cutting of the first sod in connection with the important main-laying operations in this district took place on the 22nd ult. In reporting the proceedings on the occasion, the *Bolton Chronicle* gives the following succinct account of the steps taken by the Local Board during the last few years to secure a proper supply of water to the inhabitants:—"The West Houghton Local Board were successful a short time ago in obtaining what is entitled the 'West Houghton Local Board Act, 1878.' Under the provisions of this Act, which received the Royal Assent on June 17, the Board will be empowered to provide the district with a good water supply; the inhabitants having hitherto been compelled to rely on a few scattered springs, or on the quantity of water they could themselves gather from rainfalls. This state of affairs has long been felt to be altogether unsatisfactory, but not until three years ago was the matter taken up with anything like activity. In the March of 1875, the Local Board began to take the subject into consideration, and several adjoining townships were asked if they would join with West Houghton in carrying out a scheme. Satisfactory replies not being received, the Board applied to the Corporation of Bolton for a supply; but the answer was that they could not supply West Houghton at that time, nor did they know when they could. The Board's Surveyor, Mr. Williams, was thereupon instructed to examine and report upon the merits of the scheme called the Bee Hive scheme. This scheme was to construct a reservoir near the Bee Hive Inn, Chorley New Road, into which water was to be impounded from the Bee Hive Brook. The scheme was adopted, plans were prepared, and the Local Government Board were petitioned to issue a Provisional Order for the construction of the necessary works. An inquiry was held at West Houghton by Lieut.-Col. Ponsonby Cox, on the 17th of April, 1876, and on the 6th of May following. The Local Board were represented by eminent counsel, but strong opposition was offered by the Bolton Corporation, the Bridgewater Trustees, the Wigan Coal and Iron Company, and numerous other interests in the neighbourhood. At the inquiry the Corporation offered to give a supply for ten years, at the end of which time the further term was to be decided by a three years notice on either side. These terms were not entertained: and, consequently, the Bee Hive scheme was pushed on, the Provisional Order being subsequently granted. The Corporation were then waited upon by a deputation from the West Houghton Local Board, who asked if they were willing to grant a supply of water in bulk in perpetuity at 5d. per 1000 gallons. To this the Corporation replied that they could not promise for more than 30 years, and the price would not be less than 6d. About this time the Corporation were promoting their Improvement Bill, and the Local Board assented to a proposition for including their district within the Corporation water limits; but, subsequently, a difficulty arose, and West Houghton was struck out of the Bill. The Board then went in for a confirmation of the Provisional Order; but on its coming before a Select Committee of the House of Lords, it was thrown out on a technical point of law. In this emergency the Local Board applied to the Local Government Board for powers to introduce a Bill to construct their own works on the Bee Hive Estate. The Corporation and others gave notice of intended opposition, and simultaneously the Corporation offered to supply the township in bulk in perpetuity at 6d. per 1000 gallons, to be delivered at the boundary of the district. Ultimately these terms were accepted, and the agreement thus come to was embodied in the Bill, under which the Board are now acting. The Corporation are to deliver the water at the point where the road from Chew Moor meets the township boundary between Lostock and West Houghton, near to Pocket Nook, and from this point the Local Board will deal with the water. The quantity supplied will be ascertained by meter, and the delivery commences on the 1st of January next. The Board think it probable that they may have to construct a service reservoir at Snydall Hall, in consequence of the fluctuating pressure of the mains; but this will not be proceeded with unless absolutely necessary. Meantime, the work of laying the mains from the boundary into the township is now to commence, and the undertaking is expected to be completed in three or four months. The cost is estimated at £10,000."

Register of New Patents.

1160.—Wilson, W. P., Peckham, "*Improvements in apparatus used in the manufacture of gas.*" Patent dated March 24, 1877.
This invention was fully described in the Journal for Dec. 4, 1877, Vol. XXX., p. 882.

1223.—Sirié, C. A., Paris, "*An improved apparatus for carburetting lighting gas.*" Patent dated March 28, 1877.
According to this invention, a carburetting apparatus for lighting gas is constructed as follows:—A rectangular metal box or casing is closed at top by a cover, from the inner face of which project one or more transverse ribs extending about half-way down into the casing, so as to divide this

into two or more compartments communicating with each other at bottom. The casing is partially filled with carburetting liquid, by preference a mixture of about one part of petroleum to four parts of benzine, the level of the liquid being maintained slightly below the lower edge of the partitions.

In the compartments are placed vertical light metal frames, extending from the bottom of the casing to near the top thereof, round which frames are wound lengths of cotton wick, which are consequently partially immersed in the liquid, so that the upper part thereof will be kept saturated with liquid by capillary attraction.

The illuminating gas to be carburetted is introduced through a pipe into the one end compartment, the inlet-pipe being made to extend down inside the casing between the layers of cotton wick, where it terminates above the level of the liquid in a T-shaped head having small perforations, through which the gas issues into the casing among the layers of cotton wick. As the small perforations offer a certain resistance to the flow of the gas, its pressure inside the casing will be somewhat lower than that in the supply-pipe, whereby, owing to the dilation of the gas, this will be prevented from taking up excess of hydrocarbon vapour, as is the case when the pressure in the carburetter is equal to that in the supply-pipe.

The gas rising from the inlet-pipe passes among the saturated cotton wick to the space at the top of the first compartment, whence it is made to descend, and pass below the lower edge of the partition among the frames of cotton wick in the second compartment; and, after rising to the top of this, it passes in like manner to the third compartment; and so on, escaping eventually, in the required carburetted state, to the burners through the outlet-pipe in the last compartment. The bottom of the casing slopes from either side towards a channel in the middle, leading to a cock, through which the liquid can be drawn off when required, and raised fillets are formed on the bottom of the casing on which the cotton wick frames stand.

APPLICATIONS FOR LETTERS PATENT.

2988.—Cooke, M. J., Heaton Moor, Lancs, "Improvements in cesspools, and in apparatus or arrangements for filtering or separating matters flowing thereinto." July 27, 1878.

3045.—Clerk, D., Glasgow, "Improvements in gas motor engines." Aug. 1, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

422.—Eastmure, D. G., Kentish Town, London, "Improvements in apparatus to regulate the flow of water." Feb. 1, 1878.

522.—Young, W., Clippens, N.B., "Improvements in the manufacture or treatment of illuminating gas, and in the apparatus employed therefor, the said apparatus being also applicable for the treatment of gases other than illuminating gases." Feb. 8, 1878.

542.—Joslin, G., Colchester, Essex, "Improvements in gas-meter indices, and in apparatus for testing the agreement of the measuring chambers of gas-meters with the standard gasholder and the accuracy of the indices." Feb. 9, 1878.

PATENTS WHICH HAVE BECOME VOID.

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2604.—Birrell, W., "A new or improved apparatus for regulating the pressure or production of gases and liquids." July 21, 1875.

2605.—Johnson, J. H., "Improvements in blowers or apparatus for compressing or forcing fluids." July 21, 1875.

2620.—Hellyer, S. S., "Improvements in apparatus for preventing waste of water." July 23, 1875.

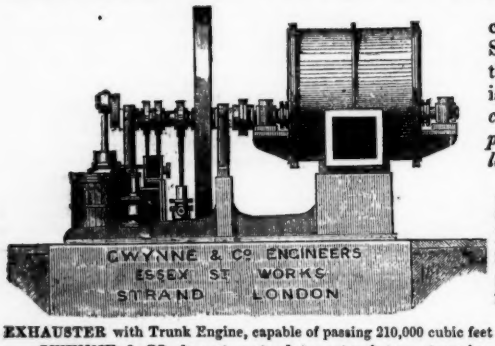
Share List of Gas and Water Companies.

(Corrected by Mr. F. N. Golding, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.
	£	Gas Companies.	£ s. d	£ s. d	£		£	Gas Companies.	£ s. d	£ s. d	£		£	Gas Companies.	£ s. d	£ s. d	£
589892	10	Alliance and Dublin	10 0 0	10 0 0	17½—18½	6200	5	Georgetown, Guiana	5 0 0	5 0 0	..	12500	5	Singapore (Limited)	5 0 0	7 10 0	5½—5¾
10000	20	Anglo-Romano . .	20 0 0	10 0 0	20—24	300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	212—217	2000	5	Do., preference .	5 0 0	7 10 0	5¾—6¼
5000	20	Bahia (Limited). .	20 0 0	3 0 0	10—11							4000	50	South Metropolitan	50 0 0	11 0 0	103—106
1000	20	Do., do., redeem.	20 0 0	10 0 0	25—27	115000	100	Do., do.	100 0 0	6 15 0	160—163	4000	12½	Do.	12 10 0	11 0 0	25—27
1500	20	Do., 2nd pref. . .	20 0 0	7 10 0	..	..	100	Grimsby Gas, A. .	100 0 0	..	203—205	20000	12½	Do., new shares .	12 10 0	11 0 0	12¾—13¼
40000	5	Bombay (Limited).	5 0 0	7 10 0	6¾—7	..	10	Hampton Court . .	10 0 0	10 0 0	17—18						pm.
10000	5	Do., fourth issue.	4 0 0	7 0 0	4¾—5¼	7800	10	Hong Kong (Lim.)	10 0 0	10 0 0	17—19	15000	10	Surrey Consumers.	10 0 0	10 0 0	18½—19½
5000	20	Bournemouth . . .	10 0 0	3 0 0	..	..		Hornsey	..	..	..	10000	10	Do., new	8 0 0	10 0 0	6¾—7¼
229700	..	Brentford	100 0 0	9 0 0	165—175	2000000	50	Imperl. Continental	100 0 0	5l. p.sh.	186—190	..	5	Tottenham and Edmonton	5 0 0	10 0 0	10¾—11
..	..	Do., 5 per ct. pref.	100 0 0	5 0 0	105—110	..	..	Kingston	..	..	..						
..	20	Do., C shares . .	10 0 0	9 0 0	7¾-8¼ pm	..	..	Lea Bridge	..	..	..	1500	10	Wandsw. & Putney	10 0 0	10 0 0	19—20
5400	20	Brighton	20 0 0	9 0 0	35—37	9000	4	Limerick Gas . . .	4 0 0	2 10 0	3—3½	1500	10	Do.	10 0 0	7 10 0	14—15
5000	20	Brighton and Hove	20 0 0	10 0 0	35—37	561000	100	Liverpool United .	100 0 0	10 0 0	199—201	2957	10	Do.	10 0 0	7 0 0	..
13000	20	British (Limited) .	20 0 0	10 0 0	38—40	169100	100	Do., B	100 0 0	7 0 0	145—147	993	10	Do.	3 0 0	7 0 0	..
7223	20	Cagliari (Limited).	20 0 0	6 0 0	16—18	384900	Sk.	London	100 0 0	10 0 0	185—189	..	..	West Kent	..	..	..
..	10	Colney Hatch . . .	10 0 0	4 0 0	9—10	1622500	Sk.	Do., 1st pref. . .	100 0 0	6 0 0	125—135	..	..	Woolwich, Plmstd., and Charlton . .	..	..	..
5500000	Sk.	Commercial	100 0 0	10 10 0	185—190	14450	Sk.	Do., 2nd pref. . .	100 0 0	6 0 0	..						
70000	100	Do., 7 per cent. .	100 0 0	7 0 0	130—135	4350	Sk.	Do., 3rd pref. . .	100 0 0	6 0 0	..	26000	5	West Ham	5 0 0	10 0 0	9—10
20000	20	Continental Union.	20 0 0	6 0 0	19½—20½	7622	25	Do., A shares . .	..	6 0 0	..						
20000	20	Do., new	12 10 0	6 0 0	½dis.-¼pm	266921	All	Do., Debent. stk.	100 0 0	5l. & 6l.	..			Water Companies.			
10000	20	Do., preference .	20 0 0	7 0 0	23—25	15000	5	Malta and Mediterranean (Limited).	5 0 0	2 10 0	2½—3	615600	100	Chelsea	100 0 0	6 0 0	150—153
75000	Sk.	Crystal Palace Dist.	100 0 0	10 0 0	192—195												
125000	Sk.	Do., 7 per cent. .	100 0 0	7 0 0	125—135	6000	5	Do., preference .	5 0 0	7 10 0	6—7	1624700	100	East London . . .	100 0 0	6 0 0	153—156
50000	Sk.	Do., preference .	100 0 0	6 0 0	125—135	29000	5	Mauritius (Limited)	2 5 0	2 10 0	⅞—1½	10798	50	Grand Junction . .	50 0 0	5 0 0	84—86
7100	25	Edinburgh	25 0 0	10 0 0	52—53	25000	20	Monte Video (Lim.)	20 0 0	8 0 0	17—18	5840	25	Do., ¼ shares . .	25 0 0	5 0 0	42—43
23406	10	European (Limited)	10 0 0	10 0 0	17½—18½	8000	10	Nictheroy, Brazil (Limited)	10 0 0	5 0 0	..	6160	25	Do., new ditto; max. div., 7½ p.c.	25 0 0	5 0 0	38—40
12000	10	Do., new shares.	7 10 0	10 0 0	6—7 pm.												
35406	10	Do., new shares .	5 0 0	10 0 0	4-4½ pm.	30000	5	Oriental (Calcutta).	5 0 0	9 10 0	7½—8	555180	100	Kent	100 0 0	8 0 0	208—212
4094840	Sk.	Gaslight & Coke, A.	100 0 0	10 0 0	186—191	30000	5	Do., new shares .	3 0 0	9 10 0	14-15pm	781800	100	Lambeth	100 0 0	6 5 0	149—153
100000	Sk.	Do. B.	100 0 0	4 0 0	78—82	10000	5	Ottoman (Limited).	5 0 0	3 0 0	2½—2¾	326150	100	Do., max., 7½ p.c.	100 0 0	6 5 0	148—151
50000	10	Do. 5 per ct. pref. conv., 4th issue.	10 0 0	5 0 0	16—17	10000	10	Parà (Limited) . .	10 0 0	3 0 0	4¼—5½	442	100	New River	100 0 0	7 0 0	320—350
						27000	20	Phœnix	20 0 0	10 0 0	37—38	4475	100	Do.	85 0 0	7 0 0	280—300
50000	10	Do. do., 5th do. .	6 0 0	5 0 0	5—6pm.	360000	100	Do., new max. 7½	80 0 0	7 10 0	112—117	400000	100	Do., deb. sk., 4 p.c.	100 0 0	4 0 0	101—103
200000	Sk.	Do. C 10 p.c. pref.	100 0 0	10 0 0	209—214	144000	Sk.	Do., capitalized .	100 0 0	5 0 0	100—103	666800	100	Southwrk. & Vauxh.	100 0 0	2 0 0	110—113
300000	„	Do. D do. do. .	100 0 0	10 0 0	209—214		20	Do., new, 1876. .	6 0 0	10 0 0	14-15pm	324700	100	Do., pref. stock .	100 0 0	5 0 0	115—117
1650000	„	Do. E do. do. .	100 0 0	10 0 0	209—214	..	..	Richmond (Surrey)	..	..	..	126500	100	Do., D shares . .	100 0 0	4 0 0	108—110
300000	„	Do. F 5 do. do. .	100 0 0	5 0 0	105—107	37500	20	Rio de Janeiro (L.)	20 0 0	10 0 0	27—29	70000	100	Do., new ordinary	..	4 10 0	..
60000	„	Do. G 7½ do. do. .	100 0 0	7 10 0	145—155	1500	32½	Shanghai	32 10 0	12 0 0	30—32	1600	100	Do., new ord. No. 1	40 0 0	4 10 0	..
1300000	„	Do. H	100 0 0	7 0 0	138—141	..	100	Sheffield, A, B, & C.	100 0 0	10 0 0	208—210	15073	61	West Middlesex . .	61 0 0	6l. p.sh.	140—143

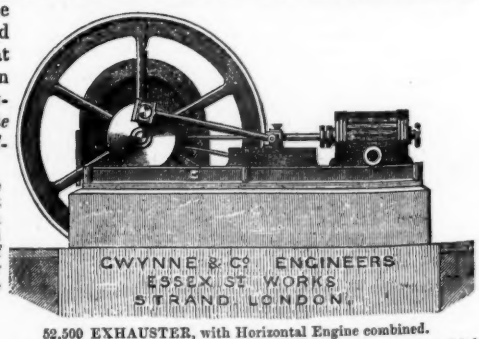
The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

WANTED, Readers of the Pamphlet, "Cooking and Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

SMALL CONDENSER.

WANTED, a 6-in. Pipe Condenser with Box.
Apply, stating number and length of pipes, and price, to Mr. COOPER, Gas-Works, BANBURY.

WANTED, one or two Second-hand Gas PURIFIERS, 4 ft. to 6 ft. square; one with a division in the centre preferred.
State full particulars and lowest price to JOHN KNIGHT AND Co., Farnworth, WIDNES.

WANTED, New or Second-hand, an ENGINE and EXHAUSTER, with or without Boiler combined, for Gas-Works making about 56,000 cubic feet of Gas in the 24 hours.
Particulars as to price, capacity, &c., to be sent to J. MEARNS, Gas-Works, Banbridge, IRELAND.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

TO DRY GAS-METER MAKERS.

WANTED, by a thoroughly experienced man, a Situation as Leather Cutter, Tyer, &c. Has a thorough knowledge of the business; nine years good character.
Address W. J., 15, Havelock Street, King's Cross, ISLINGTON.

WATER INSPECTORS.

WANTED, two competent Water INSPECTORS, capable of doing Repairs to Fittings, &c.
Apply to the ENGINEER, Corporation Gas and Water Works, BIRKENHEAD.
Aug. 1, 1878.

TO GAS COMPANIES AND GAS ENGINEERS.

WANTED, by the Advertiser, a Situation as WORKING MANAGER or MANAGER of Gas-Works. Has been in present situation nearly four years. Thoroughly competent in every branch of the profession. First-class testimonials and references.
Address No. 481, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SHEFFIELD UNITED GASLIGHT COMPANY.

WANTED, by the above Company, an Energetic and Experienced Resident SUPERINTENDENT, to take charge of a Gas Station capable of producing 4 million cubic feet per day.
He must thoroughly understand the manufacture and distribution of gas.
Applications, stating age, salary, and other qualifications, to Mr. T. ROBERTS, Chief Manager, not later than Aug. 12.
Offices, Commercial Street, July 24, 1878.

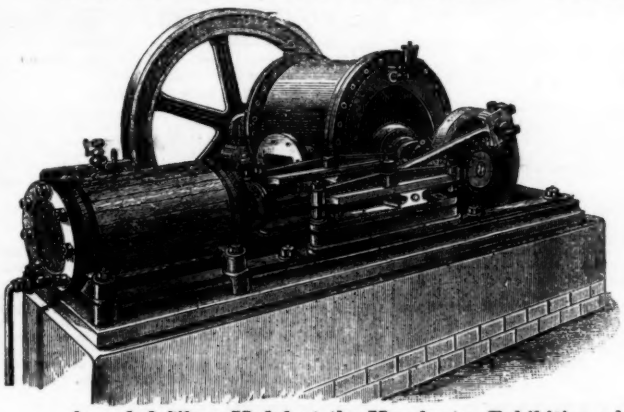
WANTED, by the Advertiser, a Situation as MANAGER in a small Gas-Work. Understands Main and Service Laying, Gas-Fitting, Internal Fitting, and Retort-Setting. Twelve years good character.
Apply to Mr. ARTHUR BROADBERY, Ramsey, HUNTINGDONSHIRE.

WANTED immediately, a thoroughly competent GAS ENGINEER, for Works situated in an exceptionally healthy British Colony. Must be a man of mature judgment and experience, thoroughly conversant with the principles and details of the Manufacture and Distribution of Gas, and professionally qualified for designing and practically superintending the construction of all Works necessary for those purposes.
Present make about 300 millions a year, and rapidly increasing.
To a thoroughly competent man a liberal salary would be given, and the situation would be a permanent and improving one.
Application to be made by letter only (in first instance), stating age and experience, and enclosing copies of testimonials, which will not be returned.
Address No. 479, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS ENGINEER.

A Provincial Gas Company require the services of a fully qualified person, thoroughly experienced in the Manufacture and Distribution of Gas, to act as SUPERINTENDENT of their Works, under the direction of the Managing Director. The annual make of gas is over 200 million cubic feet.
Applications, stating age and salary required, with copies of testimonials, to be addressed to No. 480, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS



WITH

Wrought-Iron Spindles and ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

Awarded Silver Medal at the Manchester Exhibition of the Society for the Promotion of Scientific Industry.

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

TO GAS ENGINEERS.

D. BRUCE PEEBLES & CO.

Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS. BONNINGTON, EDINBURGH.

Now Ready, price 28s., handsomely bound in Morocco, cloth sides, gilt edged and lettered,

THE FIRST VOLUME

OF

KING'S TREATISE

ON THE

SCIENCE AND PRACTICE OF THE MANUFACTURE & DISTRIBUTION

OF

COAL GAS.

EDITED BY THOS. NEWBIGGING, C.E., M.INST.C.E., AND W. T. FEWTRELL, F.C.S.

This Volume contains 460 pages of Letterpress, and is illustrated by 521 Woodcuts and 36 page and double-page Engravings, printed on Plate paper, and a full-page

COLOURED ENGRAVING OF THE BECKTON GAS-WORKS,

Forming a Frontispiece to the Volume.

ORDERS RECEIVED BY THE PUBLISHER,

WILLIAM B. KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

THE Advertiser is desirous of meeting with an Appointment as MANAGER or ASSISTANT MANAGER of a Gas-Works. Has had the charge of a works where the annual make was 90 million cubic feet of gas.

Copies of testimonials on application to JOHN HENRY LYON, 24, Park Street, MACCLESFIELD.

A BARGAIN.

FOR SALE—Seven New Iron Retorts, 7 ft. 6 in. long by 13½ in. by 12½ in. Weight. 18 cwt. Apply to the MANAGER, Gas-Works, St. Neots, HUNTS.

FOR SALE – One 50 ft. by 14 ft. Gas-HOLDER, nearly new, with Columns and Girders. Price £225, a bargain.

Also a STATION-METER, in good working order, to pass 15 000 feet per hour; and Four 10 ft. PURIFIERS with Hydraulic Centre-Valve.

Apply to J. S. REEVES, Manager, Gas-Works, BILSTON.

ON SALE, CHEAP—A Set of Mansfield's Patent Oil Gas Apparatus, with Gasholder, 12 ft. 9 in. by 8 ft.

Apply to HENRY BRASSINGTON, Tems Cottage, Giggleswick, near SETTLE.

ON SALE—A Station-Meter (with new Drum), capable of passing 10,000 cubic feet per hour, with Hydraulic Valves, Bye-Pass, &c.; 10-in. Connections. Has been removed to make room for one of larger capacity.

For particulars and price, apply to GEORGE NEWTON, Gas-Meter Manufacturer, Union Street West, OLDHAM.

STATION-METER FOR SALE, with 8-day Clock, Tell-Tale, Water-Level, Pressure-Gauge, Hydraulic Valves, and Bye-Pass, in square case. Size, 6 ft. 3 in. by 6 ft. 3 in., of a neat pattern, in good working order, able to pass 8000 feet per hour. Parted with in consequence of being replaced by a larger one.

Apply to P. WATSON, Gas-Works, STIRLING.

STATION-METER FOR SALE.

THE Gas Committee of the Rochdale Corporation offer for SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves, and Bye-Pass, and all other necessary fittings. The Meter to be removed in consequence of extensions.

Any further information thereon can be had from the Manager at the Works.

Tenders, endorsed "Tender for Station-Meter," must be sent to me on or before the 13th inst.

By order,
ZACH. MELLOR, Town Clerk.

Town Hall, Rochdale, Aug. 2, 1878.

THE Hawkhurst Gas Company, Limited, invite TENDERS for the Purchase of the TAR and AMMONIACAL LIQUOR made at their Gas-Works, at per annum, or for Two or Three years.

For further particulars, apply to Mr. GEORGE DOUBELL, Secretary, Gas Company, HAWKHURST.

Hawkhurst, Aug. 3, 1878.

AMMONIACAL LIQUOR.

THE Directors of the Wakefield Gaslight Company are prepared to receive TENDERS for the Purchase of the AMMONIACAL LIQUOR produced at their Works during the ensuing Twelve months, commencing Sept. 1, 1878.

The estimated quantity is 2000 Tons. The Company will pump it into an elevated cistern ready for delivery into Contractor's tanks or barrels.

Sealed and endorsed tenders to be sent in not later than Saturday, the 17th of August next, stating price per ton of 20 cwt.

By order,
JOHN WHITAKER, Secretary.

Gas Office, Wakefield, July 29, 1878.

TO TAR, NAPHTHA, AND AMMONIA MANUFACTURERS.

THE Gas Committee of the Warrington Corporation are prepared to receive TENDERS for the Purchase of their surplus TAR and AMMONIACAL LIQUOR, manufactured at their Works in Mersey Street, Warrington, for a period of One, Two, or Three years, from the 1st day of December next.

Specification and conditions of contract may be obtained on application to the undersigned.

Sealed tenders, addressed to the Corporation Gas Committee, must be sent to this office on or before Thursday, the 8th day of August next.

JAMES PATERSON, Manager, &c.
Corporation Gas Department, Mersey Street, Warrington, July 26, 1878.

TO COAL AND CANNEL PROPRIETORS.

THE Gas Committee of the Warrington Corporation are prepared to receive TENDERS for the Supply of the best quality of COAL and CANNEL for One or Two years, from the 31st day of August next.

Particulars as to quantity and conditions of contract may be obtained on application to the undersigned.

Sealed tenders, addressed to the Corporation Gas Committee, must be delivered at this Office not later than Thursday, the 8th day of August next.

JAMES PATERSON, Manager, &c.
Corporation Gas Department, Mersey Street, Warrington, July 26, 1878.

DARWEN CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.
TENDERS FOR CANNEL.

THE Gas Committee of the above Cor-poration are prepared to receive TENDERS for from 500 to 1000 Tons of CANNEL delivered at the Darwen Station.

Conditions and forms of tender may be obtained from the undersigned.

Tenders, endorsed "Tender for Cannel," to be addressed to Charles Costeker, Esq., Town Clerk, Darwen, on or before Tuesday, Aug. 27, 1878.

THOMAS DUXBURY, Manager.

Gas-Works, Darwen.

THE GASLIGHT & COKE COMPANY.

Chief Office, Horseferry Road, Westminster, S.W., July 30, 1878.

NOTICE is hereby given that a HALF-YEARLY ORDINARY GENERAL MEETING of the PROPRIETORS of this Company will be held at this Office, on FRIDAY, the 16th day of August next, at Twelve o'clock (noon) precisely, to transact the usual business, including the declaration of a Dividend for the half year ending the 30th day of June last.

By order,
JOHN ORWELL PHILLIPS, Secretary.

HENRY LYON (14 years Engineer and Manager of the largest of the Manchester Corporation Gas-Works) Mechanical and Consulting Gas Engineer, reports upon the condition and value of Gas-Works, supplies plans and specifications of all Apparatus appertaining to Gas-Works, and re-models existing Works.

Address Brooklyn, near Halliwell Lane, Cheetham Hill Road, MANCHESTER.

FORMBY GAS-WORKS.

CONTRACT No. 2.

THE Formby Gas Company, Limited, are prepared to receive TENDERS for the Supplying, Erecting, and Fitting of GASHOLDER and Cast-Iron TANK, Plant and Apparatus, Pipe Connections, Valves, &c., and the various matters and works in connection therewith, more particularly set forth in the drawings and specification.

Copy of bill of quantities, form of tender, and all information, may be obtained (on payment of two guineas, which will be returned on receipt of a *bonâ fide* tender) on application to Messrs. Goodison, Atkinson, and Forde, Engineers to the Company, Orange Court, Castle Street, Liverpool.

Sealed and endorsed tenders to be sent to my Office on or before the 19th day of August next.

The Company do not bind themselves to accept the lowest or any tender.

FREDERICK GITTINS, Secretary.

30, Castle Street, Liverpool.

GOSPORT GAS-WORKS.

CONTRACT NO. 3.
TO CONTRACTORS.

THE Directors of the Gosport Gas and Coke Company are prepared to receive TENDERS for the Construction of a PURIFYING HOUSE, LIME HOUSE, and other Works connected therewith, at their Gas-Works at Gosport.

Drawings and specifications may be inspected, and forms of tender and schedules of quantities may be obtained, at the Offices of the Company at Gosport, and at the Office of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after the 26th day of July inst., and tenders must be delivered at the Offices of the Company on or before the 13th day of August next.

The Company do not pledge themselves to accept the lowest or other tender.

By order,
HENRY COMPIGNÉ,
Secretary and Treasurer.

Gosport, July 24, 1878.

GOSPORT GAS-WORKS.

CONTRACTS NOS. 4 & 5.

CONTRACTS FOR IRON ROOFS, PURIFIERS, AND OTHER CAST AND WROUGHT IRON MATERIALS AND APPARATUS.

THE Directors of the Gosport Gas and Coke Company are prepared to receive TENDERS for the Construction and Erection of certain Iron Roofs, Purifiers, Central Valve, Traveller, and other Cast and Wrought Iron Materials and Apparatus required for the extension of their Gas-Works at Gosport.

Drawings may be seen, and specification and form of tender may be obtained, on application at the Offices of the Company at Gosport, and at the Office of Messrs. Thomas and Charles Hawksley, Civil Engineers, 30, Great George Street, Westminster, S.W., on and after the 26th day of July inst., and tenders must be delivered at the Offices of the Company on or before the 13th day of August next.

The Company do not pledge themselves to accept the lowest or other tender.

By order,
HENRY COMPIGNÉ,
Secretary and Treasurer.

Gosport, July 24, 1878.

BOROUGH OF HALIFAX.

TO IRONFOUNDERS, &c.

THE Gas Committee of the Corporation of Halifax hereby invite TENDERS for the following:—

Contract No. 3.—For the Supply and Erection of Hydraulic Mains, Ascension-Pipes, Cast-Iron Mains, Valves, and other fittings necessary for the fitting up of a Bench of 140 Retorts.

Contract No. 4.—For the Supply and Erection of a Horizontal Flat Screw Condenser, consisting of 14-in. Socket and Spigot Pipes, Cast-Iron Stands, and cross Brackets, Inlet, Outlet, and Bye-Pass Valves, &c.

Contract No. 5.—For Designs and Tenders for a duplicate set of Exhausters, each set to be capable of passing 60,000 cubic feet of Gas per hour, with Bye-Pass, Inlet and Outlet Valves, Governor, Pressure and Vacuum Gauges complete.

Contract No. 6.—For the Supply and Erection of two Steam Boilers, 16 feet long and 7 feet diameter, each having two Flues, 2 ft. 9 in. diameter, with Gauges, Valves, and other Mountings complete.

Contract No. 8.—For the Supply and Erection of six 20 feet square Purifiers, and wrought-iron Covers, with two Four-way Valves, one Centre-Valve, Slide-Valve, Connections, Lifting Apparatus for Hoisting the Lids, &c., complete.

Contract No. 9.—For the Supply and Erection of one Station-Meter, to pass 60,000 cubic feet of Gas per hour, with Valves and Connections.

Specifications, forms of tender, and any further particulars, may be obtained on application to Mr. William Carr, Engineer at the Gas-Works.

Sealed tenders, properly endorsed, to be sent to me on or before Thursday, the 22nd day of August next.

A. C. FOSTER, Town Clerk.

Town Hall, Halifax, July 27, 1878.

A PAMPHLET ON DIP-PIPES, &c., post free 6½d., on application to W. WHITE, Gas-Works, Aberaychan, MON. See Reviews in the *Gas Trade Circular and Review*, March 29, 1878, and *Design and Work*, March 30, 1878.

Now ready, revised and considerably enlarged, price 5s.

THE TRANSFER OF GAS-WORKS TO LOCAL AUTHORITIES. The latest statistics and analyses of working under Municipal Management, 1863-78, with the London Gas Supply, 1878, by ARTHUR SILVERTHORNE, Consulting Engineer.

CROSBY, LOCKWOOD, AND CO., 7, Stationers Hall Court, LONDON, E.C.

Price 1s., on stout paper, in stiff paper cover,

ANALYSES OF SCOTCH COALS, CANNEL, SPLINT, SHALE, &c., USED in the MANUFACTURE of GAS. By WILLIAM WALLACE, Ph. D., F.R.S.E., F.C.S., &c., Public Analyst and Gas Examiner for the City of Glasgow.

LONDON: W. B. KING,
11, BOLT COURT, FLEET STREET, E.C.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

A. FAIRLIE WILSON,

CONSULTING GAS ENGINEER,

34, ST. GEORGE'S ROAD, SOUTHWARK, S.E.

Reports and Valuations in the Management, Construction, and Structural Value of Gas-Works.

Mr. ROBERT DEMPSTER, Sen.,

CONSULTING GAS ENGINEER,

Of Messrs. Robert Dempster and Sons, Rose Mount Gas Engineering Works,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Our R. D., Sen., having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations, is both extensive and reliable.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

YEO'S PATENT ENGINE PACKING,

Price 1s. 6d. per lb., any size.

Tarred & White Spun Yarn for Pipe Joints, at various prices. Samples and testimonials free per post.

E. YEO, NEWTON ABBOT.

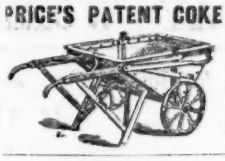
NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

MR. EDWARD SANDELL,
Associate of the Society of Accountants in England,
Publisher of the
"Gas Companies Expenditure Journal,"
Begs to announce his REMOVAL from Skinner's Place, Sise Lane, to
No 2, ST. GEORGE STREET, WESTMINSTER.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,
107, GOSWELL ROAD, LONDON, E.C.

JOHN ROMANS, C.E., F.G.S.E.,
CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

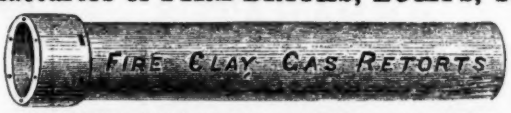
For Jointing and Repairing Retorts and Ovens *in* action and *out* of action.

A Pamphlet on the advantages of the above, with modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, GAS AND HYDRAULIC ENGINEER,
CHARLES HENRY STREET AND BISSELL STREET, BIRMINGHAM.

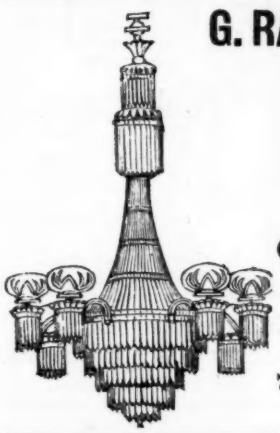
JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,



AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.



G. RAINSFORD & SON,

ESTABLISHED 1850,

MANUFACTURERS

OF

CHANDELIERS

AND

GAS-FITTINGS,

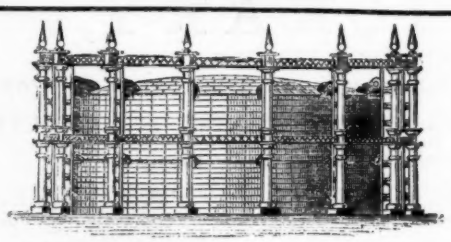
SUITABLE FOR

GAS COMPANIES.

70, BROAD STREET,

BIRMINGHAM.

HOPE IRON WORKS,



STOCKTON ON TEES.

ASHMORE & WHILE,

GAS ENGINEERS & CONTRACTORS,

MANUFACTURERS OF GASHOLDERS,

GAS APPARATUS OF EVERY DESCRIPTION,

Including Improved

Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,

And GENERAL IRONWORK.

N.B.—Estimates for all Gas Plant and Remodelling supplied on application.

THE BROUGHTON COAL COMPANY,

GAS COAL COLLIERIES, NEAR WREXHAM,

Are prepared to Supply their excellent GAS COAL on very favourable terms.

This Coal yields more than 10,000 cubic feet per Ton of gas of good quality, *in practical working on the large scale.*

A large purchaser reports the coke to be clear, of a quality rarely equalled in the retort-furnace, and much liked by the stokers.

DEAN'S PRIMROSE GAS COALS.

South Metropolitan Gaslight and Coke Company, London, July 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne.

Price and other terms on application at the

FITTING OFFICE, NEWCASTLE-ON-TYNE.

HOLMSIDE GAS COALS.

South Metropolitan Gaslight and Coke Company, 589, Old Kent Road, London, S.E., Oct. 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 80,000 tons of Holmside Coal. GEORGE LIVESEY.

FITTING OFFICE:
Address, 75, QUAYSIDE, NEWCASTLE-ON-TYNE.

CADZOW COAL COMPANY,

LIMITED.

Cadzow Collieries, Hamilton (Lanarkshire).
Office: 161, Hope Street, Glasgow.

Report on the Cadzow Ell Coal.

By Dr. W. WALLACE, F.R.S.E., F.C.S., Gas Examiner for the City of Glasgow.

I have made a careful chemical analysis and practical assay of an average sample of the Ell Coal from Cadzow Colliery, received on the 5th inst., from Messrs. The Cadzow Coal Company, Hamilton, and have obtained the following results:—

Analysis.

Volatile matters	Gas, tar, &c.	31·03	
	Sulphur	·04	46·12
	Water, at 212° Fahr.	12·05	
Coke	Fixed carbon	52·90	
	Sulphur	·03	53·88
	Ash	·95	
			100·00

Coke (dry) per ton of Coal, 1205 lbs., or 10 cwts. 3 qrs. 11 lb

Analysis of the Coke (Dry).

Carbonaceous or combustible matter	98·18
Sulphur	·06
Ash	1·76
	100·00
Specific gravity of the coal	1·250
Weight of a cubic foot in pounds	77¾

Practical Results.

Gas per ton of coal at 60° F. and 30 in. bar.	10,122 cub. ft.
Illuminating power in standard sperm candles by Argand jet, consuming 5 cubic feet per hour	16·76 candles.
Value of one cubic foot of gas in grains of sperm	402
Equivalent of a ton of coal in pounds of sperm candles	581
Durability of one cubic foot of gas by 5-inch flame	42 min. 45 sec.
Gravity of the gas, air = 1000	448

Remarks.

The sample tested consisted of a complete section of the seam, 5 ft. 6 in. in thickness. The results show that this Coal is well adapted for the manufacture of gas and coke, both being for soft coal of very fine quality. Of the many hundreds of coal samples I have tested, I have not hitherto had one with so small a proportion of ash as the Cadzow Coal. WILLIAM WALLACE.

Chemical and Gas Laboratory,
138, Bath Street, Glasgow, March 15, 1878.

ALFRED LASS,

SPECIAL ACCOUNTANT FOR GAS COMPANIES,
30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

Water Companies Accounts also prepared and adjusted.

CONSULTATIONS.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
DARTMOUTH & BRIXHAM (TORBAY) DEVON.
OFFICES:
3, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

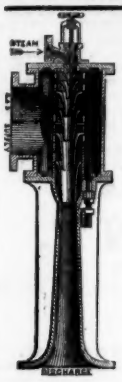
A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

BEST GAS COALS

DIRECT FROM THE
MARQUESS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

For Prices and Particulars, apply to
MR. S. J. DITCHFIELD,
LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.



KÖRTING'S STEAM-JET EXHAUSTER.

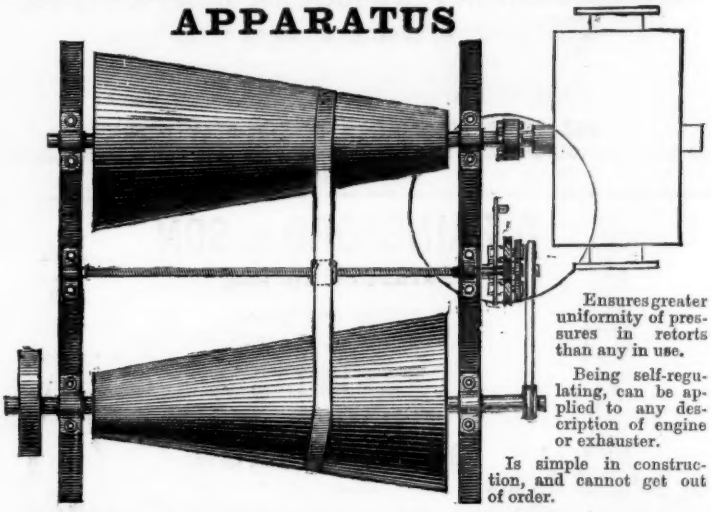
IMPROVED CLELAND'S PATENT.
UPWARDS OF 300 IN USE.
CLELAND'S SLOW-SPEED CONDENSER & STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

KÖRTING BROS.,

17, LANCASTER AVENUE, MANCHESTER,
OR TO
GERALD J. TUPP, 8, John Street, Adelphi, W.C.,
LONDON,
SOLE AGENT FOR ENGLAND AND WALES.

FISON'S PATENT SELF-REGULATING GAS-EXHAUSTING APPARATUS



Ensures greater uniformity of pressures in retorts than any in use.

Being self-regulating, can be applied to any description of engine or exhauster.

Is simple in construction, and cannot get out of order.

JASPER & WM. SNOWDON, Manufacturers,
OLD BANK CHAMBERS, PARK ROW, LEEDS.
Full Particulars, Testimonials, Descriptive Circulars, Estimates, &c., on application.

C. & S. VICKARY,

(LATE JOHN VICKARY, ESTABLISHED 1830)
GAS ENGINEERS AND CONTRACTORS, WEST OF ENGLAND GAS ENGINEERING WORKS, EXETER,
WET AND DRY GAS-METER MANUFACTORY,
Invite the attention of Gas Companies and others for the supply of
EVERY DESCRIPTION OF GAS APPARATUS.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES
OF THE
FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

THE AMERICAN GAS-LIGHT JOURNAL.

A. M. CALLENDER & CO., Proprietors. G. WARREN DRESSER, Editor.

Issued Semi-Monthly at No. 42 Pine Street, New York City.

This Journal is especially devoted to Gas Engineering and Manufacture, and is the official organ of the AMERICAN GAS-LIGHT ASSOCIATION, and the NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Subscriptions at $3.50 per annum, post paid, to Great Britain, may be made direct by forwarding Post Office Money Order or Draft to the above address. Rates of advertisement, $2.00 an inch. Special rates for larger spaces.

ARBITRATIONS, VALUATIONS, ASSESSMENTS AND PARLIAMENTARY APPLICATIONS CONDUCTED

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

THE

STANDARD WASHER AND SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

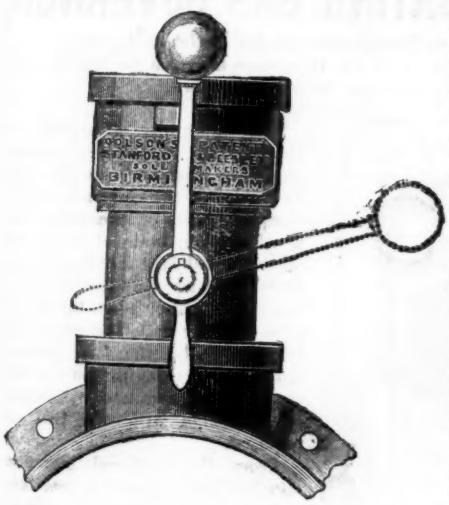
Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

Applications for Prices, &c., to be made to

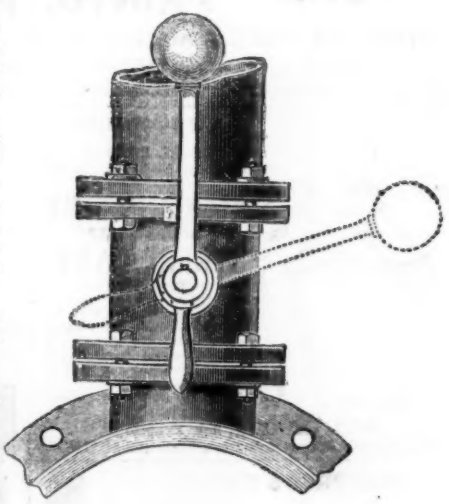
Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

COLSON'S PATENT ASCENSION-PIPE THROTTLE-VALVE.



THIS Valve is designed to supersede the hydraulic seal, and is intended to be placed immediately in or on the retort mouthpiece, or at such a distance therefrom as to be within reach of the workman. By the use of these Valves, the whole of the pressure is removed from the retorts, and a largely increased make of gas per ton obtained; the deposit of carbon is very slight, choked ascension-pipes are unknown, and the quality of the coke is improved.

When the retort is being drawn or charged, the lever, which is attached to a Spindle and Throttle-Valve, is thrown over as shown by the dotted lines, thereby closing the ascension-pipe; but when the retort is sealed, the lever is placed in a vertical position, and a free way made for the gas to pass to the relieving main.



Upwards of one hundred of these Valves have been continuously at work during the past six months at the Windsor Street Works of the Corporation of Birmingham, and no difficulty has been experienced in working retorts fitted with them in combination with others worked in the usual way with the hydraulic seal.

The following important testimonial has been received:—

Corporation of Birmingham Gas Department, Windsor Street Works, Feb. 17, 1878.

MESSRS. STANFORD AND BEESLEY.

DEAR SIRS,—In reply to your inquiry, I beg to say that the Valves (Colson's Patent) supplied by you in July last have given entire satisfaction. The retorts fitted with them are worked side by side with others having the ordinary dip-pipe, without any difficulty being experienced.

Yours truly, (Signed) CHARLES HUNT.

For further Particulars, apply to

Messrs. STANFORD and BEESLEY,

General Engineers and Sole Makers of COLSON'S PATENT ASCENSION-PIPE THROTTLE-VALVE,

89, DARTMOUTH STREET, BIRMINGHAM.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.
Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.
Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

HOPKINS, GILKES, & CO.,
LIMITED,
MIDDLESBOROUGH,
SUPPLY GAS & WATER PIPES of EVERY SIZE.
Plain, Turned and Bored, and Coated.
CAST-IRON RETORTS.
Castings for Gas-Works of every description.
EXHAUSTERS.
LONDON OFFICE: 25, LAURENCE POUNTNEY LANE.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,
SCOTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.
Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

TO GAS-METER MANUFACTURERS.
G. A. BAILEY AND CO.,
MANUFACTURERS OF EVERY DESCRIPTION OF
Station, Hourly Rate, Experimental, and other Indexes,
Wheel and Worm Cutters,
86, CRAMPTON STREET, NEWINGTON BUTTS,
LONDON, S.E.
N.B.—Materials found or otherwise.

W. LIDDALL,
Public Accountant,
15, UNION COURT,
OLD BROAD STREET, E.C.

BOUCK & CO., LIMITED,
TAR DISTILLERS & MANUFACTURING CHEMISTS,
MILES PLATTING, MANCHESTER.
BRANCH WORKS, BLACKBURN.
BUYERS OF COAL TAR,
And Crude Products therefrom,
AMMONIACAL LIQUOR, &c.

SILICATE THE BEST & CHEAPEST
For every purpose to which Paint is applied.
MANUFACTURED IN ALL COLOURS BY **PAINTS.**
THE SILICATE PAINT CO.,
LONDON— 107, CANNON STREET, E.C.
LIVERPOOL— SEEL STREET.

GAS COMPANIES AND LOCAL BOARDS
Requiring New Street-Lamps are recommended
A **KEEN'S PATENT**
DOUBLE-CLIP
STREET-LAMP.
A great improvement on the old-fashioned 14-in. Lamps.
They have been sold to various Gas-Works throughout the country and abroad, and the highest satisfactory testimonials are given as to their superiority.
B For particulars of price, &c., apply to
WILLIAM KEEN, Sole Proprietor and Manufacturer, Robertson Street, HASTINGS.

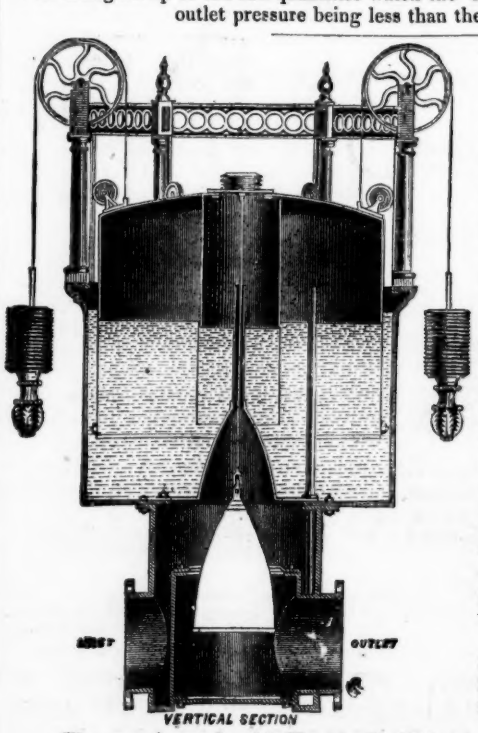
GRIRDROD'S PATENT
PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.
In use at the chief gas-works, and giving great satisfaction.
For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.
W. H. BAILEY & CO.,
Brassfounders, Gauge Injector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

GREAT SAVING OF LABOUR.
ENOCH'S PATENT
PORTABLE DRILLING-MACHINE,

Now in use by all the Principal Gas and Water Companies in the United Kingdom.
E Size, for Services in Pipes, 2 to 3 in. bore £3 10 0
F Size, for Services in Pipes, 2 to 4 in. bore 4 0 0
G Size, for Services in Pipes, 2 to 6 in. bore, with Telescope Cramp. 4 10 0
Drills, 1s. 6d. each.
Machines sent on approval, if desired.
Prices for other Sizes and Modifications, with full Particulars and Testimonials, on application to
ALEXANDER ANDERSON,
Office: 9, London Street, E.C. Warehouse: Vine Street, Minories, London, E.

GAS PURIFICATION.
BAILES & HALLSWORTH,
CONTRACTORS FOR THE
PURIFICATION OF COAL GAS
BY THEIR
PATENT HYDRATED PEROXIDE OF IRON MATERIAL.
The Material is adapted specially for taking up sulphuretted hydrogen, and will simultaneously absorb any ammonia that may pass the scrubbers.
The spent oxide resulting from our Material is more valuable than that from natural oxide of iron, and manufacturing chemists buy it in preference.
The Material has now been in use during the past three years in most of the principal Gas-Works in Yorkshire and elsewhere.
It contains considerably less moisture than natural oxide of iron, and is much cheaper and more efficient as a purifying agent.
B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.
FOR SAMPLES AND TERMS, ADDRESS—
BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY. LEEDS.

J. & J. BRADDOCK,
GLOBE METER-WORKS,
OLDHAM,
Beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.


VERTICAL SECTION
The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.
From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.
These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.
They can be made with Float in the Bell, or counterpoise as per section.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

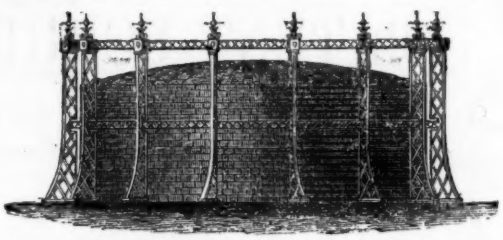
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS.

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

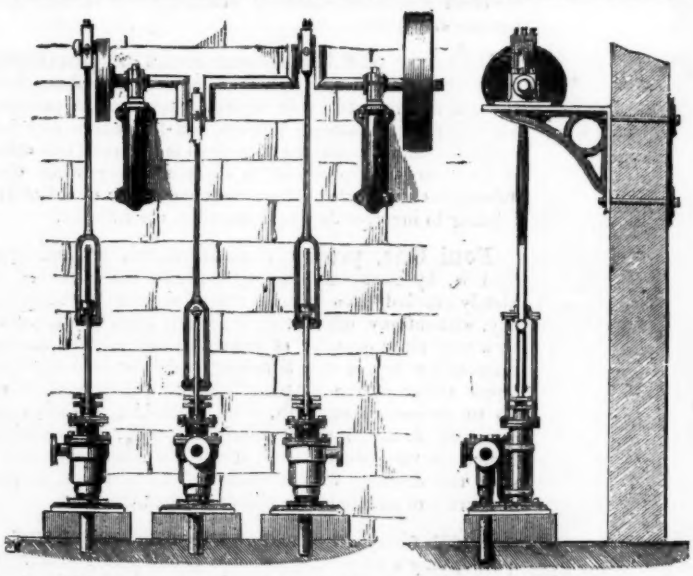
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1¼ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces, and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

S. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

Of every kind.

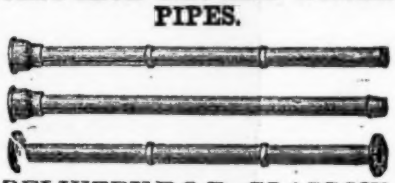
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

23 & 25, OSWALD STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.



DELIVERY F.O.B., GLASGOW.

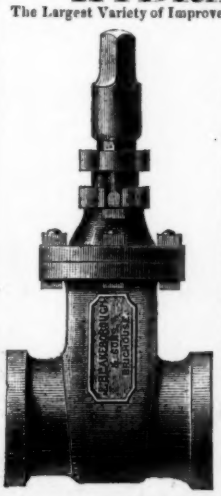
Prices on application.

SLUICE VALVES.

The STRONGEST, CHEAPEST, & BEST in the TRADE.

HYDRANTS.

The Largest Variety of Improved Designs in the Market.



SPECIALITIES.

SLUICE VALVES for Water.
DO. for Gas and Sewage, 1½ to 48 in.
RESERVOIR SLUICES
AIR VALVES.
REFLUX VALVES.
BALL VALVES.
Compound HYDRANTS.
Straight-way Do.
Screw-down Do.
Ball Do.
Sluice-Valve Do.
STAND POSTS, various.
STREET WELLS.
STAND PIPES.
PATENT FIRE COCKS
STAND PIPES & JETS.
HOSE UNIONS and REELS.
LEATHER & CANVAS HOSE.
SCREW COCKS and FERRULES.

Tested with 600 to 900 feet head of pressure.

J. BLAKEBOROUGH & SONS,

COMMERCIAL BRASS AND IRON WORKS, } BRIGHOUSE,
WOODHOUSE IRON WORKS, } YORKSHIRE.

Contractors to the British and Indian Governments.

LONDON OFFICE:

5, WESTMINSTER CHAMBERS, VICTORIA ST., S.W.,

Where Samples may be seen.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

SAMUEL CUTLER & SONS,

CONTRACTORS FOR GAS AND WATER WORKS, GENERAL ENGINEERS,

IRONFOUNDERS, AND MANUFACTURERS

OF

GASHOLDERS, TANKS, PURIFIERS,

SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS,

AND

GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & Sons undertake the entire Erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the Supplying and Laying of MAINS.

They make a speciality of supplying every requisite whatever for a Gas-Work, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

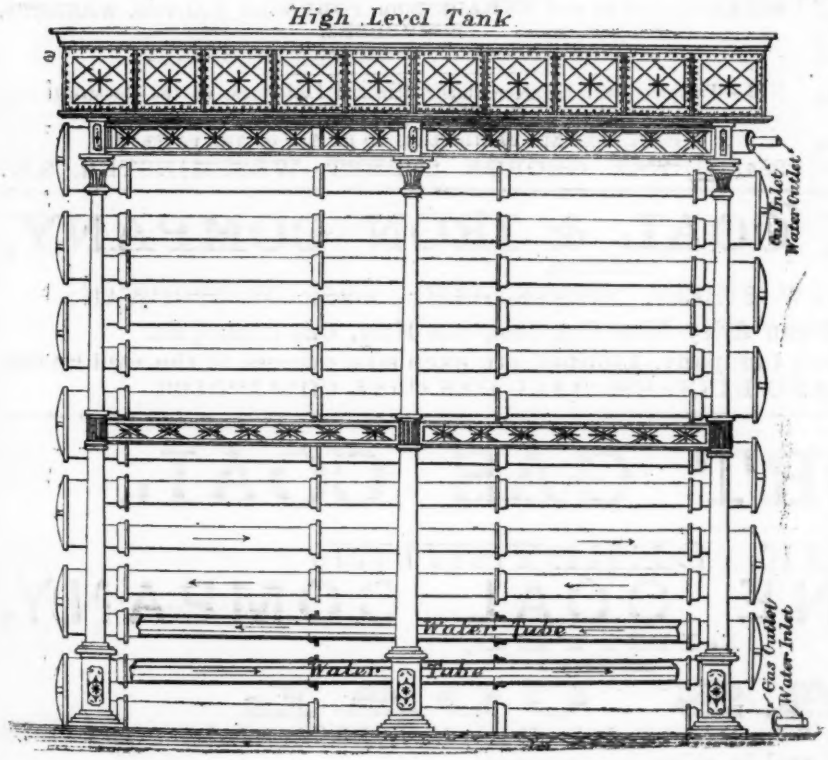
MANUFACTURERS OF

MORRIS & CUTLER'S PATENT CONDENSER

AND

CUTLER'S PATENT GAS-WASHER.

(For Illustration and Description, see "Journal" for July 23, page 145.)



Description of Morris & Cutler's Patent Condenser.

The Condenser may consist of pipes arranged in tiers as shown, or in any other form most convenient to the site available, each tier being connected with special connexions, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. (The Condenser itself may form the support for a high-level cistern as illustrated.) By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control.

The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to

Mr. F. MORRIS, GAS-WORKS, BRENTFORD,

OR TO

S. CUTLER & SONS,

PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 13,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12¾ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14¼-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

FERRAND DAVIES,

148 GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Invention

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN;

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY,

LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered in trucks at any Railway Station in England, or shipped on board at Hull, Grimsby Docks, or Barrow-in-Furness.

Purified gas per ton of coal in cubic feet (average)	10,775
Illuminating power in candles	14·71
Weight of coke in lbs. per ton of coal	1,502

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

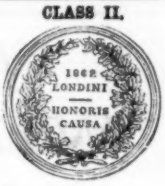
"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12.240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

1862.

CLASS II.



HALLETT'S PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

This Paint having been in general use over sixteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known. Its advantages are that—

It does not require DRIERS like other Paints.

It does not poison the painter like white lead. No colic by its use.

It has greater durability in colour, as sulphurous gases do not blacken it as they do white lead.

It is of a light stone colour, and has a body equal to white lead, and as its specific gravity is so much less, it covers equally well one-third more surface, by which a great saving is effected; a similar economy arises from its use in steam and gas joints, for which purpose it is superior to white lead.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL: Back Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.

July 2, 1877.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"*Warrington Gaslight and Coke Company,*
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON.

ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" AND "DRY" GAS-METERS,

STATION-METERS, AND GOVERNORS.

METERS, BOXES, REGULATORS, AND ALL REQUISITES FOR PUBLIC LIGHTING.

TESTING APPARATUS for all purposes relating to Gas, &c.

MR. VERNON HARCOURT'S COLOUR TESTS,

Descriptive particulars, per post, 2d.

55, 55a, & 56, MILLBANK STREET, WESTMINSTER,
LONDON, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE: 106, CANNON STREET, E.C.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c.; several of these Cranes, with the necessary power, now being erected at the Beckton Gas-Works.

DIRECT-ACTING HOISTS

FOR LIFTING RAILWAY WAGGONS TO RETORT-HOUSE STAGEWAY; CAPSTANS, &c.

HYDRAULIC RAMS for Lifting and Lowering Purifier Covers.

Sixteen now in course of erection at Beckton, applied to Covers 30 feet square.

GAS AND WATER PIPES, ROOFING, BOILERS, &c.

For particulars, apply to

JOHN ABBOT & CO., LIMITED,

2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co. 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, August 6, 1878.